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-- THE --

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-- AND --

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OF THE

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. III.

JANUARY, 1906

No. 1

In commencing a new volume, we take pleasure in thanking our contributors for the generous help which they have so readily extended throughout the year. Among so many who have assisted to make the Forester the valuable compendium of Hawaiian Agriculture it has become, we are especially indebted to Mr. Jared Smith, Special Agent in Charge of the Hawaiian Experiment Station; to Mr. Ralph S. Hosmer, Superintendent of Forestry for the Territory, whose advice and assistance has contributed in one form or another to the production of nearly all our numbers; Mr. F. G. Krauss, Agriculturist of the Kamehameha Schools; Mr. D. L. Van Dine, Entomologist, United States Experiment Station, for a timely series of papers on the insects affecting the Tobacco Industry, and to Mr. Jacob Kotinsky, Assistant Entomologist of the Division of Entomology of the Board of Agriculture and Forestry. Among those writers who have contributed more than one article of importance, are Judge Weaver, Mr. Gerrit P. Wilder and Mr. Alexander Crow.

Single papers have been received from Messrs. R. H. Anderson, Nahiku Rubber Co.; Wm. Alanson Bryan, Curator of Ornithology at the Bishop Museum; Byron O. Clark; J. T. Crawley; Henry Davis; F. H. Edwards; John Emmeluth; L. Lewton-Brain, Assistant Director, Division of Pathology, H. S. P. A. Experiment Station; Donald MacIntyre, of Moanalua; P. M. Pond; Alvin Seale, U. S. Fish Commission; J. F. G. Stokes, Curator of Polynesian Ethnology, Bishop Museum; and F. W. Terry, Entomologist, H. S. P. A. Experiment Station. Mr. J. E. Higgins, Secretary of the Farmers' Institute of Hawaii, although not contributing directly, has rendered valuable assistance. To all these gentlemen we extend our hearty thanks and appreciation.

In consequence of the inclusion of official matter in the last Forester, and of the desire to complete Volume II within the year which has just closed, the final article by Mr. Krauss was

unfortunately omitted and is presented in this number. The series of papers presented by the Agriculturist of Kahehameha Schools comprises, in a concise form, a very valuable and trustworthy addition to our scanty local literature on the care of the Vegetable Garden. The difficulties which beset the tiller of the soil in these Islands are, in the case of Gardening, seemingly intensified. With this Department of Agriculture, as indeed with all others in Hawaii, the amount of success attained, directly depends upon the degree of vigilance and labor expended.

The idea of ease and freedom from toil, so often associated by the inexperienced with the tropics, is certainly not realized by the agriculturist in this country. No luxuriant growth and generous harvest attends the "careless scratching of the soil," to which elementary operation the whole system of tropical agriculture has often been reduced in popular literature. The rice fields of Java, the land where nature has been most bountiful in those gifts which would seem to assure a prolific return to agricultural operations, alone bear witness to the tale of bricks which nature exacts from those who would eat of the fruits of the earth. In the Philippine Islands the same constant care is demanded of the husbandman. Nor are the ancient irrigation works scattered throughout our Islands, in some instances still made use of by our sugar plantations, silent as to the labor which was demanded to support the demands of a larger population. A perusal of Mr. Krauss' series of articles will, however, show that few of the problems to be solved are such as will not yield to intelligent efforts. We hope that the writer will be induced to enlarge his articles and embody them in book form.

The artistic window display of Hawaiian grown silk exhibited by Mr. D. L. Van Dine in Messrs. McNerny's Fort street store affords another practical demonstration of the undeveloped resources of the Territory. The Hawaii Experiment Station has during the past year devoted considerable attention to determining the practicability of producing Hawaiian silk, and the exhibit referred to bears testimony of success. As the Forester has often urged, opportunities are not wanting for profitable agricultural enterprise, but the need is of men of sufficient capital, industry and energy to take advantage of our local conditions. We look

forward with interest to the publication of the results of Mr. Van Dine's recent investigations.

Not only do the Australian Colonies give empirical advice through the medium of their excellent official agricultural periodicals, but they are constantly seeking new means to offer individual farmers assistance in the development of the resources of their country. The Agricultural Gazette of New South Wales for December, 1905, gives a list of Government Stud Bulls which are available for lease by Agricultural Societies or Dairy Farmers. The list contains four Shorthorn pedigree bulls, four Jersey, seven Guernsey, one Red Poll, two Ayrshire, two Kerry, two Dexter Kerry and one Holstein. The animals are hired out by the Government at a nominal sum for periods of six months under certain prescribed regulations. Other bulls are for service at the various State Farms, where also pure bred pigs are bred and sold. The system has been in operation in New South Wales for some time, and a more practical way of improving the live stock of the country would be difficult to devise.

A Title Page, Table of Contents, List of Authors and Illustrations, and General Index to Volume II accompanies this number.

THE PROFESSION OF FORESTRY.

From an interesting article by President C. W. Eliot, of Harvard University, appearing in *Science*, on Dec. 15, 1905, are copied the following paragraphs as indicative of the fact that forestry is recognized as having a place among the professions.

* * * "The large and strong universities in America are alike in their general purpose to provide good training for all the professions or intellectual occupations. It was two endowed institutions—Harvard and Yale—that started scientific schools almost simultaneously in 1846-7; and this purpose characterizes the great endowed institutions to-day quite as strongly as it does the state universities. To this general proposition there is only

one important exception: the state universities and many of the endowed institutions give no direct training for the ministry. For law, medicine, teaching, engineering of all sorts, mining, agriculture, manufacturing, the mechanic arts, and business, the American universities, so far as they discern the needs of the country, make the amplest provision which their resources permit. Several of them have lately added architecture to the list of their professional subjects. The training of professional musicians in a large sense has been taken up by a few universities. As soon as forestry was recognized as a needed profession in the United States, several universities began to provide instruction in that great subject. It is obviously the purpose of the American institutions of learning to train young men for all intellectual callings, making no distinction among them as regards their dignity and serviceableness. * * *

"It is obvious that the policy of the American universities now under consideration has had, and is going to have, a strong effect to uplift the relatively new professions, like those of engineering, applied chemistry, architecture, music, mining, forestry, the public service, transportation and large scale manufacturing. These are highly intellectual occupations not yet universally recognized as on a level with divinity, law and medicine. The American universities will, in a few generations, put them all in their higher grades absolutely on a level with the older callings." * * *

*FORESTRY REPORTS ON THE LANDS OF MAKUA
AND KEAAU, OAHU.*

At the meeting of the Board of Commissioners of Agriculture and Forestry, held on Dec. 27th, 1905, the following reports by the Committee on Forestry and the Superintendent of Forestry, were adopted and ordered placed on file. They are published here in accordance with the established usage of the Board:

REPORT OF COMMITTEE ON FORESTRY.

Honolulu, T. H., Dec. 6, 1905.

Board of Commissioners of
Agriculture and Forestry,
City.

Gentlemen:—Your Committee on Forestry beg leave to report that it has had under consideration the report of Superintendent

of Forestry Hosmer, concerning a recommendation for a forest reserve on the lands of Keaau, Ohikilolo, Makua and Kahanahaiki, on the Island of Oahu.

Your Committee has consulted both the Land Commissioner and the Territorial Surveyor, both of whom are acquainted with the location in question. They both stated to us that they had no suggestions to make. Surveyor Wall stated that he considered it the proper line for the forest reserve. Land Commissioner Pratt stated that before giving his final opinion on the matter he should want to visit the land again.

The Chairman of your Committee is well acquainted with the land in question and has been for many years, and he is of opinion that the proposed line is in the right place.

Your Committee therefore recommend that the forest reserve on the lands in question as recommended by the Superintendent of Forestry in said report of November 29th, 1905, be adopted, and that this Board recommend to the Governor in usual form the setting apart of said land so described as a forest reserve under the statute, reserving, however, rights of way from the lands of Kahanahaiki and Makua to the government land of Kuokala, lying on the northwest side of said lands of Makua and Kahanahaiki.

We remain,

Your obedient servants,

L. A. THURSTON,
W. M. GIFFARD,
ALFRED W. CARTER,
Committee on Forestry.

REPORT OF SUPERINTENDENT OF FORESTRY.

Honolulu, T. H., Nov. 29, 1905.

Board of Commissioners of
Agriculture and Forestry,
Honolulu, Oahu.

Gentlemen:—I have the honor to submit the following report upon the lands of Keaau, Ohikilolo, Makua and Kahanahaiki, Oahu, following an examination of the same made at the verbal request of Mr. J. W. Pratt, Commissioner of Public Lands, to determine the forest line. On Oct. 12th and 13th, 1905, in com-

pany with Hon. L. L. McCandless, I visited the lands, going over the ground with him and examining the local conditions.

The lands named are situated on the leeward side of Oahu, in the District of Waianae, some 40 miles from Honolulu by railway. Ohikilolo belongs in fee to Mr. McCandless. Its exact area I do not know, but it is in the neighborhood of 700 acres. The others are government lands. Makua is under lease to Mr. McCandless, the lease expiring Feb. 12, 1910. Keaau and Kahanahaiki are not under lease. The areas of these three lands as given in the Land Office list, are respectively 2,628, 2,431 and 690 acres.*

The lands lie in two roughly semi-circular basins, between two and three miles deep by from one to two miles across, running back from the sea to the ridge, making the backbone of the Waianae Range and framed in by the lateral knife-edge ridges that form their other boundaries. One of these lateral ridges separates Makua from Ohikilolo and Keaau, while a smaller one sets off Kahanahaiki from the larger valley of Makua.

The floor of each valley rises gradually from the sea to an elevation of 1,000 feet or more, perhaps two-thirds of the way to the head of the land. Above this the slopes grow rapidly steeper until they become precipitous.

The lower portions of the valleys, near the shore, contain land valuable for agriculture, including the raising of sugar cane; higher up the chief value of the land seems to be for grazing, while the sides of the steep ridges are unfit for any economic use.

Being on the leeward side of the island there is scant rainfall and as the catchment area is small the water supply is limited. One spring in each valley was visited, which is said to be the only water that is developed naturally. Wind-mills near the beach give the local domestic supply. The spring on Makua is on a kuleana not shown on the map and is piped down to a watering trough, located on another kuleana, both owned by Mr. McCandless. Some tunneling has been done to increase the flow of the spring, with beneficial results. On Keaau the spring is well up in the valley on the side of one of the minor gulches. From each spring it is estimated that a minimum flow sufficient to fill a half-inch pipe could be depended on.

* The new land list, issued during January, 1906, gives different areas for these lands; respectively 2544, 2420 and 1360.

Owing to overstocking with cattle in the past and the presence of wild goats on the ridges the forest cover on these lands has been practically destroyed. Groups of kukuis and other trees are found in the upper parts of the gulches and scattering individuals occur on the slopes, but for the most part the forest has disappeared. Only a moderate number of cattle is now pastured on the land and the goats are said to be less in evidence now than they were some years ago, before there was so much hunting as at present. Judging from the young trees that are coming up, the forest would again appear on the lower slopes were the cattle excluded and the goats killed off.

The gulch beds show that at present the greater part of the rain that falls during times of heavy precipitation rushes to the sea as flood water. While the rainfall is not constant enough nor the catchment basin large enough to permit of permanent streams, a forest cover would undoubtedly help matters by retarding the run off and making available for use at least a part of the water that is now lost in floods. It would appear also that the existing springs would have a larger flow were the slopes from which they are fed covered with vegetation.

The proposition on these lands then, is to fix a line above which the slopes ought to be brought under and kept permanently in forest. But before making definite recommendations one or two points have yet to be touched on, as they affect the location of the line by making it desirable to bring it a little lower down than might at first seem necessary.

Above the gently sloping land and below the steep upper slopes is a section too steep to be good grazing land, yet not steep enough to prevent cattle from working on it. This area should, in my judgment, be included in the forest reserve. It is just here that a forest cover would be of value, for this section is particularly subject to erosion, which if continued leads to the undermining of the steep slopes above and the consequent washing down of rock and debris onto the good land below. This is the section where the springs break out and furthermore, in the places where fencing is required the cost of construction would be materially lessened by building just below rather than across it, for this section is much cut up by small gulches.

It is true that there are now one or two small flats above the proposed line, especially at the head of Keaau, but if erosion goes on at its present rate these will soon disappear. In Keaau valley

there is a strip of moderate steepness extending from the eastern edge of the main gulch to the foot of the steep pali, which might be used for grazing, but for the reasons just given I believe it would be better under a forest cover.

The red line on the accompanying blue print shows the line which I recommend be adopted as the forest reserve boundary. This may be roughly described as follows:

Starting at a point on the Makaha-Keaau boundary, at the foot of the steep pali, somewhat above the railway, the forest line should follow the foot of the steep pali around and into the main Keaau Valley, thence up the valley on the western side of the main stream bed to a point at the head of the large flat in the center of the valley. Thence to the point on the Ohikilolo boundary, at a large hau tree, where the line turns toward the ridge, thence to and along the foot of the steep pali on the Ohikilolo ridge to the boundary line between Ohikilolo and Makua, thence up and across the ridge making said boundary and along the foot of the steep slope on the eastern side of Makua Valley to a point at the head of the main flat, thence across the valley to and along the foot of the steep slope on its western side to the Kahanahaiki boundary, thence around the Kahanahaiki Valley, following the foot of the steep slope, to a point near the shore where the pali rises above the railway, thence along foot of said pali to the Keawaula boundary.

And I further recommend that the proper steps be taken to have the portion of the above named lands, within and mauka of the proposed line, set apart as a forest reserve.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

*ENTOMOLOGICAL NOTES FROM THE DIVISION OF
ENTOMOLOGY OF THE BOARD OF AGRICULTURE AND FORESTRY.*

BY JACOB KOTINSKY.

SOAP AND SCALE INSECTS.

One needs but to mention such pests as the Avocado Pear scale (*Pseudococcus nipae*, Mask.) and the Purple scale (*Lepidosaphes beckii*, Newm.), both scale insects, to realize the importance of this class of insects in a tropical or sub-tropical country. Al-

though but some fifty odd species of scale insects were hitherto recorded from these Islands, a number of others have since been discovered and one may safely estimate the number of scale insect species on these Islands to be in the neighborhood of one hundred. Some of these are comparatively rare, others are too inconspicuous to be noticed by the casual observer; while a large number of them are so well kept in check by the predaceous and parasitic insects introduced by Mr. Koebele, in course of his work here, that while colonies of them may be found here and there, their injury is insignificant. But we still have a few species, such as the Purple scale above referred to, which are not kept in check effectively by the enemies praying upon them and which find the environment satisfactory for rapid multiplication. The amount of damage that they inflict cannot adequately be estimated for the reason that the plants they attack are only to a very limited extent cultivated on a commercial basis. Yet nearly every door yard, urban or suburban, has its citrus trees, avocado pear trees, guava, etc., and the owners of these know the blighting effects of the scales infesting these trees. Indeed, one observes many plants with leaves crumpled up and mis-shapen, the effects of colonies of scale insects ultimately destroyed by lady-birds, and wonders if it were not in wisdom's course to have mechanically, as by means of a soap wash, killed outright the infesting scales and thus prevented the unsightly appearance, to say nothing of the damage.

Unless every single species injuring a plant is taken care of by natural enemies, if the plant is to be saved from destruction, artificial remedies become inevitable sooner or later. And when the application of the remedy is made it is bound to affect practically every form of life upon the treated plant, anyway. Wanton destruction of beneficial insects shows poor knowledge and judgment, and is wrong, but the occasional killing of a beneficial insect in course of a useful and necessary application is decidedly pardonable.

Let us take for illustration an orange tree. Following is a list of insects that affect it and their natural enemies:

Pests.	Their effective enemies.
Purple scale	Practically none.
Mealy bugs	Lady-birds (<i>Cryptolaemus</i>).
Aphis or plant lice	Lady-birds.
Florida red scale (<i>Chr. ficus</i>)	Practically none.

From this it will be seen that while we can depend upon lady-birds to keep citrus trees free from mealy bugs and plant lice without doing anything for them, we cannot hope for similar results in the case of the Purple and the Florida red scales. Even then the writer has observed time and again lime trees with every leaf upon them creased and crumpled all out of shape by colonies of mealy bugs, which when examined have already been destroyed by lady-birds. Now in order to save those trees from destruction by the unchecked scales, spraying will be necessary sometime. In our equable climate and the consequent continual breeding of scale insects the application of a soap wash is equally effective at any time of the year, so that if it is made at the first appearance of the mealy bug upon the lime trees mentioned, aside from killing many purple scales, it would have also prevented the mis-shapen appearance of the leaves. It becomes evident from these facts that spraying of scale infested trees is feasible, eminently necessary, and does not conflict with our regard for the beneficial insects present.

SOAP WASH.

Upon recommendations from this office the soap wash has been repeatedly used on this and other Islands against the purple scale and the reported results were invariably very satisfactory. It is so inexpensive, so simple, so easily prepared and applied and at the same time proven to be efficacious that it becomes necessary to make the preparation of it more generally known. The proportions are

Soap 1 lb.

Water 4 gallons.

Dissolve 1 lb. of soap in a gallon of water and while it is still hot pour into the vessel containing the other three gallons. This will render the entire mixture sufficiently warm so that it will not clog the spraying nozzle. Any kind of soap will answer the purpose, though usually whale oil or soft soaps are recommended as preferable. In the case of very tender plants affected with scale insects or plant lice, ivory soap, because of its neutral properties, is probably the safest. Let it be stated here once for all, that we have every reason to believe that the soap wash here recommended is effective against all scale insects and plant lice in Hawaii, provided, it is made judiciously. It is known, for instance, that the eggs of the purple scale are not killed by the wash in the strength above given, but if it is repeated some

three or four times at intervals of three or four weeks, the scale will be pretty thoroughly subdued, for the reason that the interval will allow the eggs to hatch and the application will cover them while they are still young, when they are most vulnerable. We must also bear in mind that a heavy rain will wash off most of the application which should, therefore, be repeated soon thereafter. Let us also remove the erroneous impression that the causticity of the soap makes the soap wash effective. The fact is that it kills the insects principally by excluding the air, by choking; for the water is evaporated soon after the application is made, and the film of soap that is left forms a complete blanket about the insect and prevents the penetration of air. Best results will, of course, be obtained by the most thorough application, for it is seen that in order to kill it, the wash must actually cover every individual insect upon the plant. Yet, it is not advisable to apply much of the wash upon a single spot, for it will tend to collect by the force of gravitation in the lowest point of the spot or leaf, leaving the rest almost bare. Best results are obtained by means of a nozzle that produces a very fine spray, which should be moved about rapidly and not left playing long upon a single spot.

SPRAYING APPARATUS.

Now as to apparatus, in the writer's opinion every household should be supplied with a knapsack spray pump, preferably one in which the pump is worked by hand, just as it is supplied with a lawn mower. To his knowledge Gould's (The Gould Mfg. Co., Seneca Falls, N. Y.) "Handy" knapsack pump is one of the most serviceable apparatus. A cheaper instrument, though somewhat less handy, is a bucket pump. This is so arranged that it is fastened to the bucket and a foot may be placed upon it to keep it in position, while the operator manipulates the pump handle with one hand and the nozzle with the other. "Vermorel" is one of the standard nozzles in use for spraying purposes. For extensive operations a barrel pump, carried about upon a wagon, or even power pumps are fitted out, but in our Territory we have as yet no excuse for these larger implements of war. Californians are familiar with these outfits, for in that State, too, despite the presence of numerous beneficial insects, they are still afflicted with pests against which they are compelled to employ spraying or fumigating apparatus and substances.

MISCELLANEOUS NOTES.

Compiled by JARED G. SMITH, Director, Hawaii Experiment Station.

The consumption of cocoa and chocolate in the United States amounted to 397,066 tons in 1904; that of Germany, France, Holland and Great Britain, to 101,031 tons. Imports into the United States have doubled since 1898.

The cotton States of the South pay \$100,000,000 annually as wages to cotton pickers. One laborer can pick about 100 pounds of cotton per day. A new mechanical cotton-picker, which is being operated extensively in Georgia, Alabama, Louisiana and Mississippi picks cotton at the rate of 200 pounds per hour. It is estimated that the general employment of this type of machinery will save \$75,000,000 per annum to the growers of the South. The machine in operation requires a mule team or gasoline motor, driver and four operators. The latter are seated on the machine, and each works two mechanical, aluminum arms four feet long, moving in a universal joint. Along each arm moves an endless belt of cloth and rubber at the rate of 360 feet per minute. The belt is studded with hooks, the slightest contact with which is sufficient to remove all the fibre from the boll. The cotton passes rapidly along the belt until it reaches a brush, which sweeps the lint into a receptacle prepared for it. Using this machine five laborers can pick from 2,000 to 2,400 pounds of cotton per day, and it grades better than that picked by hand.

Capt. Baker, the founder of the United Fruit Co., gives it as his opinion that if some use can be found for the juices of the banana plant it would pay to extract the fibre from banana stems. The fibre averages 1.8% of the weight of the plant. Banana fibre would have to compete with wood-pulp for paper stock and would probably not sell for more than \$50 to \$100 per ton, the latter price being obtainable only in years when there is a shortage of sisal and manila hemp. It has been estimated that 20,000 acres of bananas would produce 9,000 tons of fibre per annum—worth from \$450,000 to \$900,000, or \$22.50 to \$45 per acre. If some use can be found for the acrid juice of the banana plant the problem of profitable fibre extraction will undoubtedly be soon solved.

Ninety per cent. of the common people in Porto Rico, according to a recent P. R. Govt. Report on "Anemia in Porto Rico," are infested with intestinal parasites. The further startling statement is made that 30% of all deaths in that island are due to "Anemia," a disease caused by these parasites. Up to 1899 Anemia was considered to be due to insufficient or faulty diet, and was in turn attributed to malaria, climate, lack of hygiene, etc. Later it was one of the things laid at the door of "American Occupation" and the Hurricane.

The parasites now known to be the sole cause of Anemia are minute blood-sucking worms, one-fourth to one-third inch long. Contrary to previous supposition it has been proved that infection takes place solely through contact of the skin of the human body with wet earth or mud containing the microscopic eggs of the worm. The motile ova pierce the skin causing a characteristic eruption at point of entrance and migrate thence through the tissues until they reach the body cavity. They then pierce the intestines and attach themselves to the inner mucous membranes and suck the blood directly from the capillaries.

Anemia owes its prevalence to soil infection from human excrement. It is a disease of the "bare-footed peoples." The eggs of the worms are killed by drying or exposure to sunshine. For this reason sugar plantations are comparatively free from Anemia, while the Porto Rican coffee estates are said to fairly reek with it, the shade and moisture furnishing ideal conditions for the long life of the eggs of this worm in the soil.

The Anemia of Porto Rico has been found to be identical with "mine sickness" or "tunnel sickness" of England and Germany. It is common among laborers in brick yards. It also occurs in certain districts of the Southern States, in Egypt, South America and probably, at least sporadically, in all the countries of the globe. Prevention consists in rigid enforcement of the use of latrines by laborers working in infected districts, and medical treatment of the sufferers. Specifics for this parasitic worm are thymol and Beta-naphthol, both of which are powerful drugs which should be administered only by physicians.

The very thorough investigation of this wide-spread tropical disease reflects great credit upon Capt. B. K. Ashford, Asst. Surgeon, U. S. A., the chairman of the commission named by Governor Winthrop of Porto Rico to study and report upon it.

The State of Sao Paulo, Brazil, has 1,908,000 acres planted in coffee. There are 545,000,000 bearing trees and 140,000,000 trees that will come into bearing within three years.

Sao Paulo has 4,585,000 acres of land suitable for coffee. Four hundred and twenty thousand laborers are employed during the picking season. The coffee trees are worth \$312,000,000. The average yield per 1,000 trees is 2,300 pounds.

The methods in use are entirely unlike the Hawaiian practice in coffee growing. The picking is deferred until the whole crop of cherries has ripened. The laborers then strip the cherry off the branches, allowing fruit, leaves and twigs to fall on the ground. When the trees have been stripped the fruit, with dirt, sticks and stones is raked into heaps, shoveled into wagons, or cars on portable track, and transported to a river, stream or flume, to be washed in sluice-boxes. These deliver the cherry free from sticks, stones, dirt and rubbish. The cherry is then transported to huge, open-air drying floors of cement or clay. The sun-dried cherry is run through hulling machinery, graded and polished, and, when bagged, is ready for market.

Santos coffee may, therefore, be produced and marketed at a profit at prices which would drive our Hawaiian growers out of business.

Labor, during the picking season, commands high prices and there is always a shortage during that period. Even paying the higher prices that labor commands during the busy season the Brazilian growers can produce coffee at a lower price and still make a profit, because their methods of picking and handling the crop are cheaper than ours. The Sao Paulo method is also better adapted to the needs of the small individual planter who can market his coffee to the large planters and mill owners in the dried cherry, practically the only investment of capital, other than his own labor, that is required, being the comparatively small cost of a drying floor.

This simplification of methods is responsible for the enormous over-development of the coffee industry of Brazil. Hundreds of thousands of European immigrants, German, Italian and Portuguese, have poured into this salubrious, rich and well-watered region. As large an area as has been already planted is still available for the development of this industry in Sao Paulo alone.

Extraordinary inducements have been offered by this and other Brazilian States, in the way of lands, prepaid ocean-transportation, loans to settlers, and in some instances guarantees of at least \$400 wages per annum. Road and railroad development have kept pace with the settlement of the land.

The price of labor is approaching a parity in all civilized countries within the tropics. A land or an industry which has an advantage over other lands and industries, through the possession of cheaper labor, more fertile soils, more stable government or legislative, and hence artificial protection can be depended on to rapidly bring itself up to the general average because of the universal desire to take abnormal profits. Sooner or later and, now-a-days, sooner, the endeavor to get out of an industry all there is in it, consequent upon this phase of human nature, will bring about over-production. Sometimes there is actual over-production of crops resulting in readjustment of prices in the world's markets, and wide-spread ruin in far distant lands. The synthetic over-production of indigo in Germany became a famine factor in India. But modifications in indigo manufacture in India have again placed the Indian ryot on a plane of fair competition with German synthetic manufacturers.

Again, over-development takes the form of planting a larger area of land than can possibly be cultivated by the visible supply of laborers. This was the secondary cause of over-production of coffee in Brazil, and is somewhat of a factor in Hawaii to-day, affecting the cost of production of sugar. The world-wide remedy for this latter phase is to substitute small land owners for the plantation system of corporate ownership of land and the employment of laborers in masses.

This remedy is being applied to relieve the coffee situation in Brazil.

The world's production of tobacco in 1903 was 2,205,174,000 pounds. The United States leads with 815,972,000 pounds. Next in order are:

British India	441,000,000 lbs.
Russia	174,000,000 "
Hungary	134,567,000 "
Japan	95,148,000 "

Germany	72,911,000 lbs.
Turkey	66,000,000 "
Java	59,274,000 "
France	57,466,000 "
Brazil	55,000,000 "
Sumatra	50,721,000 "
Cuba	37,700,000 "
Mexico	20,000,000 "

The returns for 1904 are not all in but are, as far as reported:

United States	660,461,000 lbs.
Cuba	45,748,000 "
Germany	75,794,000 "
Austria	14,047,000 "
Roumania	4,000,000 "

The 1905-6 world's production of raw silk is estimated at 40,-075,508 pounds, as against 41,098,821 pounds for 1904-5.

Mr. F. O. Licht's estimate of the production of sugar in Europe in 1905-6 as compared with the previous year is as follows:

Countries.	1905-6. Tons (2,240 lbs.)	1904-5. Tons (2,240 lbs.)
Germany	1,997,955	1,465,167
Austria-Hungary	1,304,412	816,635
France	872,670	571,369
Russia	973,716	872,670
Belgium	298,545	158,918
Holland	183,720	124,930
Others	385,812	313,243
Total	6,016,830	4,322,932

The 1905 apple crop of the United States is commercially estimated at about 23,500,000 barrels as against 45,400,000 barrels in 1904.

The 1905 hay crop of the United States is reported as short in quantity and poor in quality. Dealers east of the Rocky Mountains report slow movement of the crop because of a car famine. Prices rule much higher than in 1904.

THE VEGETABLE GARDEN.

BY F. G. KRAUSS.

DECEMBER.

The illustration accompanying this month's "Notes," "*A December Vegetable Harvest at Kamehameha*," suggests what any out-of-door home-garden about Honolulu might offer at this season of the year, and for that matter, during any other season.

The basic requirements are the planting of suitable kinds, and *intelligent and persistent management*. The success of our Chinese vegetable gardeners is principally due to the application of the latter important requisite, to the lack of which most failures among ourselves may directly be traced. If to the patience and perseverance of the Asiatic we add greater intelligence and a better knowledge of new and improved varieties, or perchance create new sorts ourselves, as some of the leading truck-gardeners of the mainland are constantly doing, why then may we become proportionally advanced over present accomplishments, and with added pleasure and profit thereto.

The varieties of vegetables represented in the illustration are:

Snap-beans—Kamehameha Selection, Golden Wax.

Garden Beets—Improved Blood Turnip Beet.

Cabbage—Sure head or Imp. Flat Dutch.

Carrots—Half Long Orange, Chantenay and Scarlet Horne.

Sweet Corn—Kam. Selection of Mammoth Sugar.

Lettuce—Improved Deacon, Hanson, and The Morse.

Onions—Australian Brown, green for table.

Radish—Imp. Chartier and Rose Queen.

Squash—Hubbard, Heart O'Gold and White Scalloped.

Sweet Potatoes—White, yellow and red varieties.

Swiss Chard or *Sea Kale*.

Tomatoes—New Stone. Acme, Honor-Bright, Spark's Earliana and Red Cherry.

The standing corn pictured in the background is six to eight feet high and makes one of the most succulent and nutritious feeders for milch cows after the roasting ears are harvested.

In order to conclude in this number the series of "notes" on vegetable-growing, which have appeared in the current volume of the Forester and Agriculturist, it is necessary to omit varieties of lesser importance.

MUSTARD—*Sirapis* sp.

Anyone having failed with all other crops might try mustard as a last resort. The improved varieties, of which Burpee's "Ford-hood Fancy" is a good example, are very desirable, when young, for salads and garnishing. It is one of the best vegetables for early "greens" and when cooked like spinach, is by some considered superior to that vegetable in flavor.

In California the common coarse growing variety has become a pest in grain fields. It is quite as easily grown here; the improved sort is not likely to become troublesome and should be given a trial by all who like a piquant salad or a good substitute for spinach.

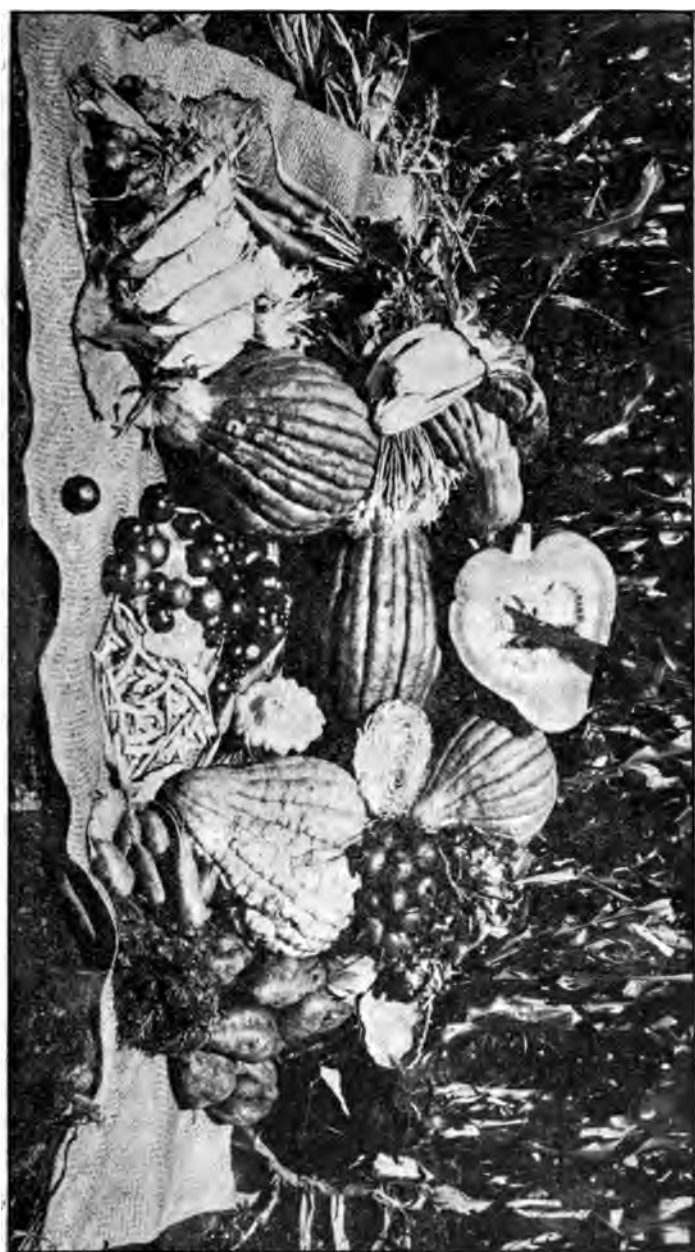
A rich moist soil is best for succulent rapid growth. Sow the seed thickly in rows ten inches apart. Within three weeks the first leaves may be cut for salad, and a few weeks later they may be harvested for greens. Additional sowings may be made every week or two, to obtain a continuous succession of tender plants. Twenty feet of drill will keep a family supplied. Keep the plants free from weed and hoe frequently.

OKRA OR GUMBO—*Hibiscus esculentus*.

This vegetable thrives in our climate, and should become better known. The young pods sliced and cooked make a splendid stock for soups and stews. They form the base of the famed gumbo soup of the French, and a few plants will supply a large family with their useful pods.

In rich soil the plant makes a large growth and should be planted accordingly. Sow the seeds in drills or hills, allowing about four square feet per plant after thinning.

Improved Dwarf Green, White Velvet and N. J. "Perfected" Perkins Long Pod are standard sorts. The former requires less



A DECEMBER VEGETABLE HARVEST AT KAMEHANAMEHA.

A DECEMBER VEGETABLE HARVEST AT KAMEHAMEHA.

(See Figure.)

Varieties illustrated: *Snap-beans*—Improved Golden Wax, Kam. Selection; *Garden-beets*—Improved Blood Turnip Beet; *Cabbage*—Sure Head, or Imp. Flat Dutch; *Carrots*—Half Long Orange, Chantenay and Scarlet Horn; *Sweet Corn*—Kam. Selection, Mammoth Sugar; *Lettuce*—Imp. Deacon, Hanson and The Morse; *Onions*—Australian Brown, Green Bunch Onions; *Radish*—Imp. Chartier and Rose Queen; *Squash*—Hubbard, Heart O'Gold and White Scalloped; *Sweet Potatoes*—White, Yellow and Red varieties; *Swiss Chard* or *Sea Kale*; *Tomatoes*—New Stone, Acme, Honor Bright, Spark's Earliana and Red Cherry.

room than the other varieties and pods earlier. The latter is the variety principally used by soup canners. Considering its prolific and continuous podding under our conditions, this crop might prove profitable for drying, and exporting, considerable quantities being used in that form.

ONIONS—*Allium cepa*.

F. ognon. G. zwiebel. P. cebola.

With dry bulbs at from two to four cents per pound in the Honolulu market, with a large and constant demand, it seems a little strange that no enterprising truck-gardener should have undertaken the culture of onion bulbs on a sufficiently large scale to supply, at least, island needs. At present large quantities are imported from California and Australia.

While the onion crop is most exacting, under skilled management, a number of varieties do exceedingly well here. Not quite as prolific and large, perhaps, as the California product, yet sufficiently so, and of such excellent quality that we can ordinarily compete with the imported article.

At Kamehameha Farm, the Australian Brown variety has succeeded best, while not so large as some of the standard American sorts, it is unusually firm and a splendid keeper.

Prize Taker and Large Red Withersfield, two favorite California varieties, have also done fairly well with us, likewise Yellow Danvers.

Anyone contemplating onion culture for bulbs, should make an exhaustive variety test, covering several seasons. Fully twenty standard sorts are listed by seedsmen and it may require several years of careful selection to produce a strain that will best meet local conditions.

A reasonable price should be paid for seed and that of best quality only sown. Cheap onion seed is usually worse than useless, and is dear at any price, as the writer can attest from the handling of many tons as a seedsman.

Prices fluctuate from year to year, single pound lots range from 75 cents to \$2.00 per pound, according to variety and season.

Sown in drills 12 to 18 inches apart requires from 5 to 8 pounds of seed to the acre. One ounce will sow 100 feet of drill.

It will pay to utilize the richest soil available for this crop. Next to fertility, freedom from weed-seeds is of most importance.

Do not attempt to sow onion seed in foul ground; the cost of hand weeding the onion crop has nearly landed some onion-growers in the poor-house. In other words prepare your soil before sowing rather than after planting. Nothing pays better in this crop than good seed and thorough tillage. As "mellow as an ash heap" is a good condition to have your soil in. Those fortunate enough to have such soils, should take care to *firm* the soil over the seed immediately after sowing. The seed should not be covered over one-half inch in depth. When the plants are three inches high, thin out to three or four inches apart. In growing onions on a moderately large scale, no better hand implements can be used than the "Planet Jr." line; with the various attachments supplied with these machines, drills can be made, fertilizers distributed, seed sown, covered and rolled all at the same operation, necessitating, of course, a perfect condition of the seed bed; later the wheel hoe, rakes, etc., may be used to cultivate and harvest the crop. When bulbs have attained their full size and maturity as indicated by the dying down of the tops, they are ready for harvest, which should be carefully done to insure good keeping qualities. Two hundred and fifty to 1,000 bushels per acre is the range of yields, though as high as twenty-five tons has been reported from the best favored California regions; such yields, however, mean very low prices.

To grow "bunch" or green onions from sets, requires very little skill, and no kitchen garden is complete without a family supply of this wholesome vegetable.

PEAS (garden varieties)—*Pisum sativum*.

F. pois a ecosser. G. schal-erbsen. P. ervilhas do grao.

The successful growing of garden-peas must always be limited to the short cool winter-spring season in our low lands; heat, especially dry heat, is disastrous to this crop. Our best efforts with a large number of varieties have produced indifferent results, though it should be said that at the Kamehameha Girls' School, the old standard, Yorkshire Hero, also known as the Alameda Sweet Pea in California, has done exceedingly well during some seasons. A light, moderately rich soil is considered best for this crop. The dwarf varieties may be sown in drills two feet apart, medium and tall sorts four to six feet apart. One pound of seed will sow 75 feet of drill.

PEPPERS (Chile)—*Capsiam annuum*.

The prevalence of the small cayenne peppers all over the Islands speaks well for its adaptability to our conditions. No vegetable seems freer from insect or fungus pests than this plant, and its productiveness is marvelous. Being perennial it does not require re-planting, and when propagation becomes necessary it is readily grown from cuttings.

The mild flavored, large fruited sorts also do well with us, and a few plants should find a place in every garden. The following are standard sorts that have succeeded well at Kamehameha: New Chinese Giant, Ruby King, Large Bell or Bullnose, Red Chili, Black Nubian and Golden Dawn. The former is a beautiful fruit, sometimes attaining a diameter of five or even six inches, and the "sweetness of an apple."

Sow the seeds in a nursery-box, and when sufficiently large for transplanting, set out 18 inches apart in rows two feet apart.

RHUBARB—*Rheum sp.*

F. rhubarbe. G. rhabarber. P. ruibarbo.

Anyone interested in experimental horticulture, would do well to give rhubarb a trial. It is a delicious vegetable, and the writer sees no reason why it should not thrive in island regions suitable to its fullest development, of which there should be ample for home requirements. In California it thrives on a great variety of soils—from heavy clay to light peat, providing ample moisture is available.

A fine lot of some fifty plants, grown from imported root, divisions of Luther Burbank's Australian crimson introduction, were planted several years ago and became well established. Two or three cuttings were made, when after a protracted wet spell, one after another of the plants died. Doubtless, had the plants been "lifted" and cut back they might have been saved. Stress of other cultures has thus far prevented further trial. Monarch, Victoria and Linnaeus are the varieties grown in California. Burbank's Australian crimson is a very promising sort and should be grown in comparison with the old standard varieties.

Much time is gained by planting root divisions instead of seeds. They should be set two by four feet apart.

SQUASHES.

MAMMOTH SQUASHES OR PUMPKINS—*Cucurbita maxima*.

F. potirons. G. melonen-kurbiss. Italian, zucca.

MARROWS, SCALLOPS, ETC.—Summer varieties, *Cucurbita pepo*
winter varieties, *C. maxima*.

Squashes are of two distinct types: the early maturing, so-called summer varieties under which may be classed the white and golden scalloped bush, the summer marrows and crook-necks, etc. The so-called winter sorts produce large, hard-shelled fruits, suitable for winter storing; the old standard Hubbard variety being a characteristic representative, Large Boston Marrow, Mammoth Chili, etc., are other standard winter varieties.

A few plants of the bush and trailing varieties of squash should be in every garden, if room is limited one may confine himself entirely to the bush varieties, thus economizing space. These have the further advantage of early maturity and the readiness with which they may be protected from the disastrous fly.

The rarity of choice Hubbard squash in the Honolulu market at this season of the year should be suggestive to the market gardener. During Thanksgiving week in 1903, not a Hubbard squash was obtainable in our local market until the Kamehameha Schools sold 500 pounds, at five cents per pound, to an enterprising green-grocer, who called for more three days later.

The cultural directions given for melons apply to the growing of this crop, except that the bush varieties may be planted more closely, two or three feet apart each way. We have obtained best results from early spring and late fall sowings, when the fly pest seems least prevalent. Middle of August planting will bring Hubbards for the November and December holidays.

TOMATOES—*Lycopersicum esculentum*.

F. and Spanish, tomate. G. liebesapfel.

With good plants to start with, tomatoes would be an easily grown crop during the entire year, were it not for the fly nuisance. It is almost impossible to guard against this pest, and many otherwise fine fruits are injured by its unceasing attacks, except in a few favored localities. We know of no specific remedy.

against the fly, if we or any one else did, our melon, squash and tomato troubles would be at an end. Unless our entomologists find a parasitic insect to prey upon these garden foes, it is up to the horticulturist to produce resistant varieties. All familiar with the small cherry tomato, which has run wild along our roadsides, must have noticed its immunity from attacks of the fly. Mr. Byron O. Clark, of Wahiawa, has grown a plum-shaped tomato of moderate size and excellent quality for several years, which is said to be entirely resistant. Perhaps success is to be looked for along these lines, as in the case of the grape against phylloxera.

The following are standard varieties:

Acme—Early ripening, of medium size.

Beauty—Medium, early, large, finely formed.

Favorite—One of the largest perfect-shaped, deep red.

Honor Bright—Grows in clusters, choice.

Paragon—Large, solid and smooth as an apple.

Ponderosa—Largest of the family, but not finely shaped.

New Stone—Large, handsome, productive.

Trophy—Standard late variety, good canner.

Golden Queen—A large, smooth, pure yellow tomato.

Of the small fruited, ornamental varieties, the following may be mentioned: Red and Yellow Pear, Red and Yellow Plum, Red and Yellow Cherry, Burbank's Preserving, the latter a most distinct variety, bearing its fruits in clusters like currants. The first aim of the gardener should be to produce good, stocky young plants of his chosen variety, in the meantime adequately preparing a choice well-sheltered piece of ground, to which the plants should be transplanted, preferably on a cool cloudy day. Water immediately after setting and give clean culture. Cutting the plants back makes them more stocky and self-supporting but the rank growing varieties are better trellised.

If stable manure is used it should be thoroughly rotted and applied to the field before the plants are set out. After the plants are well established and dry weather approaches, a mulch of straw or grass will be found beneficial in keeping down weeds and retaining moisture. A quick-responding commercial fertilizer may be cultivated in during the plant's development; 50 to 100 pounds nitrate of soda as a top dressing around the plants often producing good results.

For rot, spray with Bordeaux mixture once weekly, after fruit begins to form. For leaf blight, spray with Ammonical capper

carbonate solution soon as there are any indications of the disease. Up-root and burn badly infested plants.

SWEET POTATOES—*Convolvulus Batatas*.

F. patate douce. G. batata. Spanish, batata.

Sweet-potatoes are an important and almost universal crop in the Hawaiian Islands, and their culture is so simple and so well understood that it is not necessary to enter into details here. The tuber seems to thrive every where, on the steep dry slopes of Punchbowl or in the low reclaimed muck of the taro-patches.

At Kamehameha the white, yellow and red varieties are regularly grown. The white variety is considered decidedly the best, both in quality, productiveness and earliness.

MISCELLANEOUS.

ROSELLA—*Hibiscus Sabdariffa*.

This plant has recently come into prominence as a jelly plant, and it certainly is very excellent for that purpose. It is widely cultivated in the tropics and grown on a small commercial scale in Southern Florida and Southern California, for its fleshy calyxes, which when cooked make an excellent sauce or jelly with the flavor of cranberry. The juice of the calyxes also makes a fine cooling acid drink, and might be introduced by some enterprising druggist at his soda fountain.

Rosella has been grown at Kamehameha for several years, the plant is a strong grower and attains a height of five to eight feet. With us a full year elapsed before the plants come into flower, when they blossomed profusely, and continued so for an extended period. The greatest drawback is the amount of work necessary to harvest the sepals.

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(Concluded.)

PEPPERS.

A shipment of peppers from the Nevis Experiment Station, recently forwarded to London by the Imperial Commissioner of Agriculture, has been disposed of at very good prices.

The consignment consisted of sixty-four pounds net weight of yellow Nepaul peppers and fifty-three pounds of ordinary red chillis.

The former realized the very high price of fifty-one shillings per hundredweight. This, however, is not, according to the brokers' report, to be attributed to their intrinsic value, but to their being in a very small lot and to competition between two bidders who particularly wanted them. "We should not think it safe to expect more than thirty shillings per hundredweight for any quantity."

The red chillis realized twenty-six shillings per hundredweight. These were reported slightly mouldy and would appear not to have been properly dried before shipment.—*Agricultural News, Barbadoes.*

CORRESPONDENCE.

The following communication, written by Dr. Walter H. Evans, Chief of Insular Stations, has been received by The Forester for publication:

UNITED STATES DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS,
INSULAR EXPERIMENT STATIONS,
WASHINGTON, D. C., December 22, 1905.

"In the Commercial Advertiser of December 2, I noticed a report by Mr. Kotinsky of the occurrence of the green scale on vanilla plants in Hawaii, and the statement, 'It is the "green bug," a scale pest which, in seventeen years, wiped out the coffee industry of Ceylon.' I presume by green scale is meant *Lecanium viride*, as this species is reported on coffee and many other plants. Neitner, in *The Coffee Tree and its Enemies*, Ceylon, 1880, revised and corrected by S. Green, does not mention this species, but it is noted in *Insect Life*, Vol. 1, p. 293, as quite destructive in Ceylon. In *Insect Life*, Vol. 2, p. 17, kerosene emulsion is reported as having been successfully tried against the green coffee scale. In the same volume, p. 265, Cotes reports the successful use of kerosene emulsion in Ceylon over a sufficiently large area to test its practical applicability. Zimmermann, in *Teysmannia*, 9 (1898), No. 5, pp. 240-243, reports *Lecanium viride* in Java as being attacked and destroyed by a fungus, *Cephalosporium lecanii*.

"The statement referred to above that the destruction of the coffee in Ceylon was due to a scale insect was rather startling to me, as I had been taught that the coffee industry was destroyed by the leaf fungus *Hemileia vastatrix*. Some two years ago I had the pleasure of meeting in this city Dr. J. G. Willis, Director of the Botanical Gardens, Peradeniya, Ceylon, and as I had just been appointed Chief of the Division of Insular Stations, I was anxious to learn from him all that I could relating to tropical agriculture. Dr. Willis was quite definite in the statement that the destruction of the coffee in Ceylon was due to the leaf rust, and urged upon me the necessity of a rigid quarantine in Hawaii and Porto Rico against the disease. Similar directions were given me by Sir Daniel Morris, formerly at Ceylon, and now Commissioner of Agriculture for the British West Indies.

"In order to confirm or dispel the idea that I had formed, I have been looking over some of the treatises in the library that relate to tropical agriculture, and I find they practically all agree that the destruction of the coffee industry in Ceylon was due to the leaf rust, as mentioned above.

"Willis, in *Flowering Plants and Ferns*, Vol. 2, p. 93, says of coffee: 'The plant is subject to the attack of many insects and fungi, one of the latter (*Hemileia vastatrix*) was the cause of the ruin of the coffee industry of Ceylon.'

"Simonds, in *Tropical Agriculture*, 1889, mentions various insect pests of coffee, but calls particular attention to the destruction caused by *Hemileia vastatrix*.

"Nichols, in *Tropical Agriculture*, 1892, p. 105, says: 'In Ceylon the cultivation of coffee was practically ruined some years ago by a fungoid or vegetable blight which was found to be incurable.' Further he says: 'Insect enemies can be kept in control by cultural methods and the use of insecticides, principally kerosene emulsion.'

"Semler, in *Die Tropische Agrikultur*, 2d ed., 1897, describes at length *Hemileia vastatrix* as the greatest enemy of coffee culture, and calls especial attention to the destruction caused in Ceylon.

"Robert Wallace, in *Indian Agriculture*, says: 'The coffee industry in Ceylon was destroyed by the blight *H. vastatrix*.'

"Dybowski, in *Traité pratique de cultures tropicales* (1902), calls attention to the coffee leaf rust as the most serious enemy of coffee. In a similar way a number of others refer to the subject.

"The Hawaiian Coffee Planters' Manual, which was printed in 1894, on page 41, quoting from Ferguson's Directory of Ceylon, says: 'In the early days, black bug or blight affected the coffee plant very seriously, but who hears of blight now? One hundred thousand acres have been planted . . . and the area affected by bug has been most trifling. But the place has been more than filled by the most terrible of all diseases, *Hemileia vastatrix*, or coffee leaf disease.'

"In the pamphlet by Nietner, which I have mentioned above, the losses up to 1880 attributed to scale insects are given as £125,000, while the editor says the *Hemileia* caused losses of over £12,000,000.

"From the foregoing statements I think you will get some idea of my opinion relative to the green scale scare. I do not doubt but that, if this insect should become thoroughly established, it would cause great loss, but the rather extravagant statements referred to seem to me unwarranted, and they might result in causing alarm to the coffee growers if allowed to go unchallenged."

Yours very truly,

WALTER H. EVANS,
Chief of Insular Stations.

ORRIS ROOT CULTURE.

Referring to the very large number of inquiries received at the U. S. Department of Agriculture in regard to the subject of orris root cultivation in the United States, Prof. Rodney H. True, Physiologist in Charge of Drug Plant Investigations, Bureau of Plant Industry, makes the following statement:

As is well known, the orris root of commerce is grown almost exclusively in Italy, the chief centers of production being at Florence and Verona. The plants yielding this article are the common species of *Iris*, especially *I. florentina*, *I. germanica*, and *I. pallida*, cultivated widely as the common fleur-de-lis of many gardens. In many letters, advertisements are cited in which the cultivation of orris root is boomed as a quick road to wealth, and the conditions of the market are described in glowing but entirely

misleading terms. One advertisement states that orris root is worth 40 cents per pound, is protected by a duty of 25 per cent, and meets with an annual demand equaling \$2,000,000. On this basis, an offer of roots for cultivation is made at an excessive price. As a matter of fact, the average price of dried orris root of commercial grade varied between 3.8 and 9.6 cents per pound during the period from 1897 to 1904, inclusive. There is no duty on orris root. The total importation averages about \$20,000 annually. During the last two years the orris business in Italy has been in a somewhat dubious state, due to the low price realized and the lack of profit to the grower. Owing to such deceiving statements as above cited, there is a great likelihood that many people will be misled to their financial loss. Some advertisers claim to have the indorsement of the Department of Agriculture, whereas the Department has in no way suggested the culture of orris except on a small scale in a purely experimental way. It is of the opinion that the outlook for building up the orris industry in the United States is at present not good. Although a limited demand may arise for roots for purposes of cultivation, one should not fail to remember that an orris industry can be built up only on the basis of the utilization of the root in a commercial way.

THE HAWAIIAN STOCKBREEDERS' ASSOCIATION.

The Hawaiian Stockbreeders' Association held a session on December 18, for the purpose of hearing special reports and electing officers for the ensuing year.

A report was read by Dr. Victor Norgard, Territorial Veterinarian, on animal diseases. Mr. Kotinsky, entomological division of the Hawaiian Board of Agriculture and Forestry, made an address on horn-fly insects and lantana. Mr. Jared Smith, director of the Federal Experiment Station, read an address on imported grasses.

The election of officers resulted as follows: A. F. Judd, president; A. W. Carter, vice-president; A. M. Brown, secretary; R. W. Shingle, treasurer; E. P. Low, representative from Hawaii; L. von Tempsky, from Maui; J. F. Brown, from Molokai; Eric Knudsen, from Kauai, and H. M. von Holt, from Oahu.

IMPORTED SONG-BIRDS.

Foreign song-birds are much desired in this country for æsthetic reasons, but the Government is not disposed to encourage their importation, fearing lest they prove the reverse of a blessing. The skylark, so generally admired, and which has been made celebrated by poets, is a grain-destroyer in Scandinavia—for which reason the Bureau of Mammals and Birds has recommended that no more of this species shall be admitted.

Already a colony of imported skylarks has been successfully established near Portland, Oregon, and there is another at Flatbush, in the outskirts of Brooklyn. People often say: "Listen to the singing of the skylark!" Appreciative of its melody, they are glad that the bird should have been brought to us from foreign parts. As a matter of fact, however, it is the voice of the native thrush that they hear. They heard the same voice long before the skylark arrived on the scene, but did not listen.

The starling (a pretty bird that lives in large flocks) has been successfully imported from Europe, and is now quite plentiful along the Hudson River. It has not done any damage yet, so far as known, but in New Zealand, where it has been likewise introduced, it has taken to eating cherries and other fruit, and is regarded as a pest. The trouble is that a bird harmless in its native habitat may adopt new habits when transported to a different clime. In such matters it is safest to leave Nature alone.

The English sparrow is not a nuisance of much importance in the Old World, but how glad we should be to get rid of it! There is no hope, however—as may be judged from the experience of Bermuda, where this feathered pest has been domesticated. The total area of Bermuda is only forty-eight square miles, and yet in a war waged between the authorities and the sparrow the latter has come out emphatically a victor. Bounties paid for the destruction of the "rat of the air," as somebody once called it, nearly bankrupted the insular treasury without reducing appreciably the numbers of the birds.

Where game birds are concerned, our Government has no hesitation about permitting their introduction. They are large enough to be shot, and, if they become too numerous at any time, they can be reduced to the requisite extent by declaring an open season and inviting the sportsmen to tackle them without hindrance.—*Saturday Evening Post.*

THE FARMERS' INSTITUTE OF HAWAII.

Honolulu, Hawaii, Jan. 22, 1906.

NOTICE.

The annual meeting of the Farmers' Institute of **Hawaii** will be held at Kamehameha Schools on Saturday, February 3, 1906.

The programme will be as follows:

AFTERNOON SESSION.

2:30 p. m.—Business Meeting.

Report of the Secretary-Treasurer.

Election of Officers.

Report of Committee on Co-operative Marketing.

3:30 p. m.—Spraying Demonstration—

D. L. Van Dine.

J. E. Higgins.

4 p. m.—Inspection of the farm and shops of Kamehameha Manual Training School.

EVENING SESSION.

MusicKamehameha Glee Club

Address of Welcome.....President P. L. Horne

Response and President's Annual Address.....

.....Mr. Jared G. Smith

MusicKamehameha Mandolin Club

The Use of the Agricultural Colleges.....Prof. U. Thompson

MusicKamehameha Glee Club

Sisal and other Commercial Fibres.....Mr. Wm. Weinrich, Jr.

All those who are interested are cordially invited to be present at both the afternoon and evening sessions.

(Signed.)

J. E. HIGGINS,
Secretary-Treasurer.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Shower, Pride of India, Poinciana, Albizia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haugh, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.
Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.
First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables etc., into the Territory of Hawaii." General Circular No. 1; 8 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

"Out of Print.

ANY one or all of the publications listed above (except those marked *) will be sent to residents of this Territory free, upon application to Mailing Clerk, P. O. Box 281, Honolulu.



VOL. III

FEBRUARY, 1906

No. 2

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. III.

FEBRUARY, 1906

No. 2

MUNICIPAL IMPROVEMENT.

The concerted action of the many local improvement societies which have lately been organized, is already having a beneficial effect upon the appearance of the city, and during the last few months unsightly neighborhoods have taken on an attractiveness and even beauty hitherto unsuspected. In a municipal movement of such widespread interest and importance, and into which so many and varied interests have required to be harmonized, it has been gratifying and encouraging to note the degree of unanimity and good fellowship which has actuated all those who have been associated in it. This has been significant of the general recognition of all parties and organizations of the necessity of stimulating a civic pride which till now has allowed itself to lie dormant, or at the most, to manifest itself only in a few of our more favored suburbs.

In a country in which nature has been so lavish in the infinite variety of her gifts, the tendency in the past has often been to neglect to render her that aid which would have been necessary in a less favored land. It has often been forgotten that the hand of man, whether directed to architecture or agriculture, mars and disfigures rather than embellishes the manifestation of natural beauty. This is the more emphasized in countries abounding in luxuriant and tropical vegetation, among which the efforts of man often stand out in incongruous and unpleasing contrast. In such countries, it is therefore the more necessary that all buildings and permanent works should, as far as is consistent with utility, be constructed in conformity with their surroundings and in harmony with the natural genius of the place.

One universal rule may safely be put in force as the initial step for all improvement clubs. It may be formulated thus: "The first method of beautifying a locality is to put it in order and to cleanse it." In this none can go far wrong. However,

it is essential that those to whom authority has been delegated to act in these matters, be vigilant and jealous lest our country's natural beauties be impaired by such fantastic undertakings as have been voiced of late, and which are not only inconsistent and grotesque, but calculated to render the community which tolerates them a laughing-stock to all lovers of good taste. Without doubt two of the very best suggestions which we have heard have been made by the Catholic and Anglican bishops respectively. The former has advocated the drawing of a large map upon which the general scheme of progress and improvement may be marked out and followed over a period of years, and the latter has cautioned us lest in improving our own city we be misled into attempting to make it resemble any other. These two maxims are worthy of being given full attention. By closely following the former our efforts will not be ephemeral or rendered futile by spasmodic effort, but the line of advance will be steady and harmonious. By observance of the latter we shall take advantage of all the peculiar characteristic natural beauties which surround us, fostering their preservation and development, and vigorously excluding all absurd anachronisms and alien influences, until the name "Hawaii nei" be as a talisman to conjure to all who have visited our fair land a vision of beauty, and simplicity and truth.

In this number there is reproduced a circular recently published by the Division of Forestry, entitled "An Offer of Practical Assistance to Tree Planters."

Following the lines that have become familiar through similar offers of assistance made by the United States Forest Service and by the Forestry Bureaus in several of the States, this circular sets forth just what the Division of Forestry is prepared to do to assist individuals or corporations desiring to establish forest plantations, windbrakes, or to do other forest work.

The present offer is not a new departure, for during the last two years the Division of Forestry has at all times stood ready, so far as means and time have permitted, to respond to like requests. The time has now come when more attention can be paid to this phase of the work, and the circular referred to has accordingly been prepared and widely distributed throughout the Territory. It is hoped that many applications for assistance will result from it.

A PRELIMINARY ACCOUNT OF INSECTS OF ECONOMIC IMPORTANCE IN THE HAWAIIAN ISLANDS.

BY F. W. TERRY.

*Division of Entomology, Hawaiian Sugar Planters' Association
Experiment Station.*

(Continued from Vol. II, p. 73.)

GENERAL REMARKS.

Diptera (True Flies).

This order of insects is a large and well defined one, and many of its members are extremely important economically, since they are directly injurious to man and domestic animals. Every one is familiar with those persistent atoms of annoyance—"mosquitoes"—several species of which are the means of conveying disease and death to thousands, in the form of malaria, elephantiasis or yellow fever, as the recent mortality at New Orleans and the neighborhood has demonstrated. Again immense areas of otherwise valuable pasturage and agricultural areas in Southeast, Central and West Africa, are at present practically closed to settlement and development, owing to the presence of the dreaded "tsetse" flies; these acting as the intermediate hosts of the micro-organism *Trypanosoma*, producing the "nagana" or "sleeping sickness," so fatal to stock and man. Others, too well known, are the Bot-flies, Buffalo-gnats or "Black Fly," Horse-flies, Horn-fly and Screw-worm, all extremely injurious to stock, the larvae of the latter sometimes even causing death in man.

The fruit flies are also a great menace to our fruits, as the Melon fly has proved on these Islands. The Gall-gnats, although extremely small and delicate, are also a formidable group; perhaps the best known of which are the "Hessian fly" and "Wheat midge." Besides this army of markedly injurious flies, there are numbers apparently of little economic importance, although no doubt as our knowledge of these increases, many will be removed from the "unimportant" to the ranks of the "beneficial" or "injurious."

Opposed to this vast army of markedly "injurious" flies is a perhaps larger one of "beneficial" species. Of primary importance are the numerous parasitic flies; these in conjunction with parasitic hymenoptera help to control the myriads of injurious plant-feeding insects, which left to themselves, would soon wipe out vegetation and humanity itself. The "flesh" or "blow-flies" are excellent scavengers, and undoubtedly their larvae are especially beneficial in warm climates, by rapidly converting putrid and offensive animal matter into a less noxious condition.

The larvae of many others are extremely useful owing to their insectivorous habits.

Family *Culicidae* (Mosquitoes).

We are fortunate in possessing but three species of this annoying family, although in suitable localities their numbers more than compensate for the lack of species. The eggs are deposited either singly or in a batch upon the surface or margin of standing water. The larvae and pupae are both aquatic, the former being familiarly known as "wigglers." The males do not bite and can be readily distinguished by their plumed or bottle-brush-like antennae. The habits and life history of the mosquitoes of these Islands have been fully discussed by Van Dine¹, so the following remarks need to be but brief.

Culex fatigans, Wied.

This is the common "night" mosquito. It is destitute of any very definite marks and the legs are unbanded. The general coloring of the body and legs is a light golden-brown. The eggs are deposited in a boat-shaped cluster or raft. According to Theobald² this species has a very wide range, throughout tropical and subtropical countries; and appears to be extremely closely related to *Culex pipiens* and the North American *Culex tarsalis*. The former is found in the Hawaiian Islands, and *C. pipiens* and *C. tarsalis* are found in the Philippines. The eggs of these three species are very similar, and they are

¹ Hawaiian Mosquitoes, Hawaiian Islands, vol. 6, Haw.

² Theobald, Mosquitoes of the World, vol. II, pp.

at least distinct races. They are certainly distinct in habit from personal experience, for although *C. pipiens* is very common in England, it practically never bites in that country.

Stegomyia fasciata, Fab.

This is the common "day" mosquito here, and the intermediate host of the yellow fever micro-organism is at once distinguished from *Culex* by the alternately banded dark-brown and white legs. The body is a dark chocolate brown, the thorax bearing a central pair of thin whitish lines and a lateral pair of curved whitish patches. The abdomen also has narrow whitish transverse bands. The eggs are nearly black, and deposited separately, floating horizontally on standing water.

Stegomyia scutellaris, Walk.

This also is a "day" mosquito and at first sight appears to be very similar to *S. fasciata*. It is generally somewhat smaller and much darker, the general coloring being blackish, with a white central line on the thorax; the abdomen is banded with thin white transverse bands. The legs are black with white bands. The eggs closely resemble those of *S. fasciata*.

Family *Chironomidae* (Midges).

The small delicate flies of this group are commonly known as "gnats" or "midges." They are frequently to be observed flying in swarms, over or near water, both in Europe and America. Their larvae are mostly aquatic, many of them being of a brilliant red color, which are known as "blood-worms." One species (*Chironomus hawaiiensis*) is quite common in Honolulu and some of the other Islands. It is a small inconspicuous grey fly, and is often mistaken for a mosquito; the red larvae are at times very abundant in reservoirs and ponds, where they are undoubtedly beneficial, feeding upon minute organisms and decayed vegetation and thus rendering the water purer.

Family *Stratiomyidae* (Soldier-flies).

These are sluggish flies, with flattened bodies and large eyes; one of the commonest species here (*Sargus* sp.) has a metallic-green thorax, the abdomen in the male being dull bluish-black, in

the female bright metallic-blue. The larvae are greyish-buff and flattened with pointed heads, and are frequently found in decaying banana stems.

Family *Dolichopodidae*.

This family of graceful little flies is represented by numerous species on these islands, many of which are native and restricted to the forest region. They are of small size, (the largest being considerably less than a house-fly) and possess long and delicate legs. One species is particularly common. The eyes are large and prominent. The thorax and abdomen are of a metallic golden-green, the wings also possess a delicate iridescence. These flies may often be seen resting on low-growing plants and may sometimes be observed to suddenly rush upon some minute insect, seizing it in their lance-like mouth appendages and sucking the juices.

Very little appears to be known about the larvae, they are stated to live in the earth or decomposing vegetation.

Family *Limnobiidae* (lesser crane-flies).

This family of flies is readily recognized by their slender bodies and very long and slender legs, these very readily becoming detached when handled. The larvae are mostly elongate and inconspicuous in coloring and are frequently found in decaying vegetation. The species on these islands are of no economic importance, and owing to their delicate form they are often mistaken for mosquitoes, but upon examination it will be found that they are utterly devoid of any piercing organs and therefore quite harmless, but since they are frequently confounded with mosquitoes, the above reference has been made to them.

Family *Syrphidae* (hover-flies).

This is a large family, and are popularly known as "hover-flies" from the characteristic habit of hovering in mid-air and then rapidly darting away. They vary greatly in size and coloring, the majority, however, are conspicuously marked with light or yellow bands.

Volucella obesa, Fab.

This fine fly is very common in the gardens around Honolulu and may often be seen poised practically motionless in mid-air, then darting rapidly out of sight. In size it is about equal to that of a honey-bee and stoutly built; the upper surface is of a brilliant metallic bluish-green, the ventral surface having a bright purple sheen.

I have not bred the larva, but it probably feeds in decaying vegetation.

Eristalis punctulatus, Macq.

This common hover-fly somewhat resembles a honey-bee in form and size. The large eyes are of a reddish-brown. The thorax pale buff, with four distinct longitudinal black bands. The abdomen is tawny in the male, with dark transverse bands; in the female these bands are nearly black, and very distinct.

The larvae is aquatic, living in stagnant and foul water, feeding upon stable refuse or decaying vegetation, around which the female flies may frequently be observed depositing masses of the white slender eggs. The whitish larva is maggot-like and semi-translucent, the digestive and other organs being easily visible through the tough skin; it belongs to that type known as "rat-tailed," since it possesses a very long and protusile breathing-tube, which is capable of being extended for nearly two inches; by this means the larva can remain hidden in the submerged mud and continue its respiration unchecked.

Xanthogramma grandicorne, Macq.

This pretty little hover-fly is extremely useful, since its larva is a most voracious devourer of plant lice or aphides. The adult which is about one-half inch in length may frequently be observed hovering over an aphid-infested plant, then with remarkable rapidity she alights on a leaf, deposits a single egg, and is gone, to repeat the process in some other suitable location.

The eyes are large and reddish brown. The thorax a shining steely-blue. The abdomen is a rich yellow with decided black transverse bands.

The eggs are white and the greenish or reddish slug-like larvae are invariably present upon any plant infested with plant

lice. They are extremely voracious, thrusting their small pointed heads amongst the crowded aphides, and sucking these unfortunates dry in an extremely short time.

Family *Pipunculidae*.

These little flies are of considerable economic importance, since the majority of those known, are parasitic upon injurious insects, especially the plant-sucking bugs or leaf-hoppers. There are several species on these islands, some of these are enumerated and described and the habits of the family fully discussed by Perkins.³ They are considerably less than a house fly and black or nearly so, the wings also being dusky, and owing to their very inconspicuous coloration and active flight can be very easily overlooked, as they hover through the low-growing vegetation hunting for their prey. Generally the fully-fed larvae leave their moribund hosts and pupate in the ground.

Family *Tachinidae*.

This family is an extremely important one since all its members are parasites, and destroy an immense number of injurious insects of all orders. Although some are large and conspicuous, they are extremely difficult to classify, and very few of those existing on these islands have been identified. One of the largest and most common is a member of the genus *Chaetogaedia*. This is a large grey fly, with several stiff bristles distributed over its thorax and abdomen. The head is large and wide.

The larva is a whitish maggot which is parasitic on numerous species of cut-worms and other moth larvae, both introduced and native.

Family *Sarcophagidae* (Flesh-flies).

This family includes some extremely useful scavengers, commonly known as "flesh-flies"; the larvae feeding upon any decaying animal matter.

The common species of *Sarcophaga* on these islands are large grey flies, with dark longitudinal stripes on the thorax, and dark checkered markings on the abdomen. Some species are vivi-

³ Perkins (R. C. L.), "Leaf-hoppers and their Enemies," Bull. No. 1, pt. IV. (Div. Entom.) Haw. Sugar Planters' Exp. Stat.

parous, the females depositing larvae instead of eggs; these larvae commence feeding immediately, and rapidly convert the noxious material into a condition rendering it more suitable for plant assimilation.

Family *Muscidæ*.

This family includes many scavengers also, and such well-known forms as house-flies and blow-flies. The larvae vary somewhat in habits, but the majority feed in animal and vegetable refuse.

Musca domestica, Linn. (House Fly).

The term "house-fly" has become a household word, and so well-known are these insects that even a brief description is superfluous. Undoubtedly, owing to its promiscuous habits of feeding, this fly is a very important medium for the transportation of numerous disease-producing micro-organisms. The larvae are whitish pointed-headed maggots and appear to feed very generally in stable-refuse.

Stomoxys calcitrans, Linn. (Stable Fly).

This small brown fly causes considerable annoyance to stock and superficially resembles the house-fly, but upon closer inspection it will be found to possess a well-developed set of piercing mouth organs differing very considerably from the harmless retractible sucking tube of the latter insect. The larvae are small yellowish-white maggots and feed in horse ordure.

Haematobia serrata, Rob-Desv. (Horn-fly).

This little greyish--brown fly is extremely injurious to cattle, swarming at times upon the unfortunate beasts, which become weakened by loss of blood and the constant annoyance and sores caused by their attacks. Its presence on these islands appears to have been first recorded in 1899.⁴

The larvae are of a bright yellow and about one-third inch in length, very pointed at the head extremity. These together with the reddish hard egg-like pupae may be found in cow ordure, the

⁴ Rep. Minister Interior, Haw., for 1898, p. 80.

eggs being deposited there by the female fly soon after it leaves the cow.

Two hymenopterous parasites are known to attack it on these islands.

Various spraying solutions have been tried to render the infested cattle immune to attack, but the relief obtained even when an application is possible is of a very temporary nature.

Apparently from various reported experiments one of the most effective compositions consists of train-oil with a small percentage of sulphur or carbolic acid added, this rendering an immunity of five to six days. Fish-oil, coal-tar and kerosene emulsion are also recommended.⁵

An ingenious fly-trap has been tried, with apparently satisfactory results. It is described as follows: "The device is described as a structure 6 feet high and 4 feet wide, fitting closely in a stable door. On the outer side is hung a curtain, while the inner side, next to the door-way, is composed of broom corn extending from the top downward and from each side toward the center, so that the cow in going through is brushed over every part of the body, while the elastic broom corn, springing back into place, prevents the flies from following her into the stable. The roof of the structure is of wire netting, in which is a trap which the flies can enter but cannot leave. In use the cow is driven into the pen, the curtain let down behind her, and as she passes into the stable the broom-corn brush sweeps off the flies, which by a shake of the curtain are sent up into the trap. The editor of the Canadian Live Stock Journal, according to the press account, saw twenty-eight cows put through this contrivance in twenty-eight minutes, including the placing of the device at three barn doors."⁶ The application of this or a similar type of trap seems quite practical, where the stock are housed daily, but I am not aware of the attempt having been made on these islands.

Family *Ocstridae* (Bot and Warble flies).

These flies are serious pests to stock. The larvae live within the digestive tract and frontal sinus, or enter beneath the skin causing large sores and often rendering the hides practically valueless.

⁵ Insect Life, Vol. II, pp. 102-103.

⁶ Insect Life, Vol. VII, pp. 425-426.

Gastrophilus equi, Fab. (Common Horse Bot).

This fly is common at certain seasons around stables and on horse ranches, where they may be observed darting at the flanks, legs or mane of the animal. Aided by the pointed abdomen they deposit their eggs thereon, each of which are securely attached to a hair. These yellowish-white eggs contain larvae, which are licked up by the unfortunate animal and thus conveyed into the esophageal tract, whence they travel into the stomach, sometimes occurring in such numbers as to cause the death of the host. Upon passing from the horse the fully-fed larvae (which are about three-quarters inch in length) pupate either in the manure or earth.

The adult is somewhat bee-like in size and form, of a tawny-brown color with dark patches on the thorax and abdomen, the whole body being densely covered with short fine hair. The wings are yellowish with darker patches.

One practical remedial measure has suggested itself to many, that is, to scrape (or shave) off with a sharp knife the eggs; this should be repeated at frequent intervals (three or four days) during the egg-laying period.

Oestrus ovis, Linn. (Sheep Bot or Head Maggot).

This fly appears to be present on the sheep ranches here, although personally the writer has not seen it.

The eggs are deposited in the nostrils of the sheep, the larvae soon hatch, travelling up the nasal passages and entering the frontal sinuses, where they remain until attaining maturity; they then descend via the nasal passages and pupate in the soil.

The adult insect is similar in general appearance to that of the horse-bot, but greyer and much smaller.

Hypoderma sp.? (The Ox Bot or Warble).

To what extent warbles occur on these islands I do not know, but they are certainly present. The species obtained has not been definitely identified. These flies are bee-like and hairy, bearing a general resemblance to the horse bot; the coloring of the body, however, differs from the former insect. The head and thorax being covered with rich golden brown hairs, the abdomen

is black with grey hairs, except a middle transverse band which is naked. The wings are dull and devoid of any markings.

The eggs of this genus appear to be attached to the hair in a similar manner to those of *Gastrophilus*, but usually several are placed on a single hair. Some diversity of opinion appears to exist as to how the larvae enter beneath the skin. Dr. Cooper Curtice⁷ concludes that the young larvae are licked into the oesophageal tract by the host, the walls of which they pierce, travelling along the muscle tissue until they arrive beneath the skin of the back; this they proceed to pierce, producing a cyst or "warble," and feed upon the purulent matter caused by the inflammation which is set up; finally they leave the cyst and entering the soil pupate.

Family *Trypetidae*.

This family includes many very beautiful little flies, one very general characteristic being the striking ornamentation of the wings. They are mostly injurious, the larvae feeding in fruits, or forming swellings or "galls" in the flowers or stems of various plants.

Dacus curcurbitae, Coq. (Melon Fly).

This serious pest is as far as at present known the only important member of that dangerous family, the "fruit-flies," which we possess. Since its arrival it has practically stopped the raising of melons, cucumbers, squashes and tomatoes in many localities, unless these plants are carefully screened from the attacks of the fly. Besides the above-mentioned, various other fruits of cucurbitaceous, ranunculaceous and also leguminous plants are attacked. The eggs are deposited either in the tender parts of the fruit or in the soil beneath the plant, and develop rapidly, continuing to grow until the fruit is in a very advanced condition. This pest

is very common in the West Indies, and is also very common in the United States. It is a very common pest of melons, cucumbers, squashes and tomatoes. The larvae are very destructive, and the fruit is often ruined. The fly is a very common pest of melons, cucumbers, squashes and tomatoes. The larvae are very destructive, and the fruit is often ruined. The fly is a very common pest of melons, cucumbers, squashes and tomatoes. The larvae are very destructive, and the fruit is often ruined.

thorax. The wings are large and glassy with small brown patches near and at the tips; they are usually held at right angles to the body when the fly is at rest (a position characteristic of this group).

The larvae are of the typical fly-maggot form, about one-third of an inch long and yellowish; they leave the plant to pupate in the ground. They are capable of leaping quite a distance, this action being caused by the curvature and then sudden release of the tension of the body.

FARMERS' INSTITUTE ANNUAL MEETING.

At the annual meeting of the Farmers' Institute on February 3rd, the question of the formation of a Produce Exchange to facilitate the marketing of the products of the soil grown in these Islands, and to thus give an impetus of the most practical kind to diversified agriculture, was taken up and received very favorable consideration. The subject will be considered by the Board of Directors of the Institute, and it is expected that material results will soon come from this consideration.

The first session of the annual meeting was held February 2nd, afternoon, at Kamehameha School, and the following officers were elected to serve for the ensuing year: Jared Smith, president; Wm. Weinrich, Jr., vice-president; F. G. Krauss, secretary-treasurer, and W. W. Hall, Alexander Craw and Prof. P. L. Horne, directors.

Following the election of officers there was a demonstration of manufacture and spraying with koresene emulsion to kill scale and bugs on plants, conducted by D. L. Van Dine, and a like demonstration of the manufacture and use of the Bordeaux Mixture for killing fungus growths, conducted by J. E. Higgins. Following this, the members of the Institute inspected the stock farm and dairy and gardens of the Kamehameha Schools, finding much to interest them there.

EVENING SESSION.

The evening session of the Institute, to which the public were invited, was held in one of the Kamehameha school rooms and was attended by many persons who are interested in agriculture.

The meeting opened with some excellent music by the Kamehameha Boys' Glee and Mandolin Clubs, after which Principal Horne welcomed the Institute and those present to the schools, speaking of the increased interest that had been shown in scientific farming in the last decade, and of the work that the Farmers' Institute had already done for Hawaii. He spoke, also, of the work being done at Kamehameha in the way of farming, spoke of it proudly because from that work substantial results had come. He said that an apiary would be added to the school's possessions this year, that it already possessed a splendidly stocked dairy and the model piggery on the Islands.

PRESIDENT SMITH'S RESPONSE.

Speaking in response to the address of welcome, and delivering his annual address, President Jared Smith said:

The year 1905 has been a very successful one for the Farmers' Institute of Hawaii. I have been pleased to note a constantly increasing interest on the side of agriculture for which this organization stands—diversification as opposed to, or in contrast with, a one-sided industry. There is undoubtedly now greater confidence in the ability of our people to produce from the land a variety of products. We are beginning to see the possibilities of great things coming out of minor industries.

In other words, I note on every hand a willingness to help when the question of trying to do impossible things comes to the front. This change in sentiment, a sort of conversion from the position of opposition to one of tolerance, if not of active assistance, is a most striking feature of the year's progress. Four years ago, when the Farmers' Institute made its first beginning, to dub a man a "small farmer" was no compliment. I note today general sympathy with the movement, and a change of front on the part of many people and interests who, when I came here to establish an experiment station five years ago, were, at least, passively hostile to this innovation.

For this change of attitude the Farmers' Institute and other similar organizations, such as the Hilo Agricultural Society, the Live Stock Breeders' Association, the Poultrymen's Association, are largely responsible.

Increase in the membership of this Institute and increase in the number of organizations formed along collateral lines, indi-

cate a constant widening of the field. Within another five years I hope to see flourishing societies on every island of the group devoted to the interests of bee-keeping, coffee, tobacco, pineapples, bananas, vanilla, sisal, cotton, grapes, as well as marketing associations to bring more intimately together those whose interests should be in common.

It is the aim of the Farmers' Institute to supply a common ground on which both scientist and farmer can stand, each to learn from the other.

Most scientific men lack practical experience, and many farmers lack scientific knowledge. Each have their theories. Keep the two apart and the theories are liable to run to seed, which when planted produce strange products. I often think that the scientist gets more from the farmer than he ever gives. Most farmers will agree with me on this point. This Institute is intended to be a common battleground, where every man can speak his mind. We are all working for the same end—the betterment of the conditions of life, and whatever tends toward increase of the prosperity and general affairs of Hawaii. I sincerely hope that good things accomplished in 1905 will be far overshadowed by the achievements of 1906.

Secretary Krauss then read the following letter from the Delegate in Congress, which, it was explained, should have come up at the afternoon business session:

January 4, 1906.

The Farmers' Institute, Honolulu, Hawaii.

Dear Sirs:—Desiring to further all proper efforts for the diversification of the industries of our Territory, I have had a consultation with Secretary James Wilson of the Department of Agriculture, in regard to securing soil surveys of at least a part of each island in the group.

The Secretary has promised to give favorable consideration to the subject, and added that if he decided that he could extend this work to Hawaii, he would also follow it up by sending a tobacco expert to assist in establishing that industry.

I accordingly have the honor to request that your organization draft and forward to the Secretary of Agriculture a formal request or petition, asking that soil surveys be made in the Territory of Hawaii, and that a tobacco expert be assigned to make a

special study of our local conditions and assist in getting the tobacco industry established on a sound basis.

Hoping that you may send such resolutions to Secretary Wilson by an early steamer, I am, very truly yours,

J. KALANIANA'OLE,
Delegate to Congress.

USE OF AGRICULTURAL COLLEGES.

Prof. U. Thompson was then introduced, and read the following paper on "The Use of Agricultural Colleges":

The Agricultural Colleges belong to the people, and the people should use them as freely as they use their horses or their farms. If you ask how these colleges can be used, I can at least tell how some people are using them. And no doubt, other ways will be developed, as the people realize their value.

The first way is for young men and women to go to these colleges and take the course in agriculture. While East, I heard of two cases that will serve as illustrations. A farmer in Central New York was in debt for his farm. He had toiled long hours each day for years; but the mortgage was immovable. When the son has grown to young manhood, he decided to take a course in agriculture at Cornell. The father supplied him with money, which increased the mortgage, and the son worked extra time at college for additional funds to pay his expenses. He spent his vacations at home working reforms in the way of fruit growing and better dairy stock and methods. When he had completed his course, he returned to the farm and took the helm. In three years he cleared the farm of the mortgage.

The second case was of another farmer who was even more unfortunate than the farmer already mentioned, for, work as he would, the mortgage grew, year by year. When he died the farm was sold to satisfy the mortgagee. There was a small amount left over. The daughter took this money and went to Cornell. She worked extra time for money to help pay her expenses and finally graduated from the Agricultural Department. Then she rented the farm her father had lost and began fruit growing. Today she owns the farm.

These are only isolated cases. But throughout the country you see results of like training in orchards and stock and production. You hear much about scientific farming, but can not

help realizing that with most of the older farmers, these terms mean very little. You also realize that the younger farmers appreciate what is being done at the Experiment Stations; and many of the boys will know what the Agricultural Colleges are doing,—what scientific farming really means.

Second—Farmers can use the Agricultural Colleges by sending problems directly to the professor interested. The California farmers are using the Agricultural Department of their university, for all it is worth. Hundreds of soil specimens are sent in to be analyzed,—so many specimens that the old methods of analyzing soils had to be abandoned, and a short method is now in use, by which a chemist can determine from 8 to 12 specimens a day, with sufficient accuracy for all practical purposes. Pests of all kinds swarm about the entomologist; seeds that won't grow and seeds that are not pure find their way to the seed specialist; and when crops fail to be produced in sufficient quantities to satisfy the farmer, he invites the agriculturist to come and see what the matter is. And the agriculturist goes. Not simply because he is a servant of the state, but because he is interested in whatever interests the farmer. The experts are kept alive and progressive. Dr. Hilgard says that when he has a problem he can't solve, he goes to the farmer. The farmer has the facts which Dr. Hilgard with his trained mind can put together and make science of. The farmer of today may not get relief in all his problems; but he gets enough relief to keep hope alive in the children, and the grandchildren will reap the benefit from the questions the farmers of today are asking the scientists.

Third—The people can use the Agricultural Colleges, through the Experiment Stations, through the new Industrial High Schools that are being developed, through the nature study that is growing in importance, and through the model farms that are coming. The Agricultural Colleges will train a vast army of young men and women for work in the Experiment Stations, in the Industrial High Schools, in nature study and for the model farms.

The work of the Experiment Stations is so well known that I need not say anything about them.

The Industrial High Schools are of so recent development that I venture some explanation. These schools are located in the country, and in the villages and country towns. They are in response to a demand from the farmers. There will be class-room

work and laboratory work, shop work and farm work. The courses will lead to the professions, to business, the sciences, the trades and to the farms. In short, these schools are intended to do for each industry what the Manual Training High Schools are doing for the trades.

There is a growing appreciation of elementary work in the sciences, nature study, some call it, and a demand for trained teachers to do this work as it should be done. The Chicago Normal School has just arranged for training teachers for this work, on a new basis which probably puts it in the lead of other institutions. Now comes the question as to whether the Agricultural Colleges will long permit a normal school graduate to rank higher than the college graduates.

I found the United States Agricultural Experiment Station men very sensitive about model farms. But I am willing to risk my reputation as a prophet on the statement that the model farm will be the next step in agricultural development. And here are my reasons: A large percentage of farmers can not translate the college bulletins and the experiment station bulletins into farm language and farm practice. This must be done for them. And the place where it is done will be the model farm. And if agriculture continues to develop as we hope to see it develop, the model farm will continue to be an advantage even to the college-bred men, just as a hospital is an advantage to physicians who wish to keep abreast of their profession. The business of the agricultural college should be to develop the science of agriculture and so it will always be in advance of the agricultural stations. And the stations will always be in advance of the model farm. And the model farm will be in advance of the great majority of the farmers, translating the work of the colleges and stations into farm practice.

The day for individual effort is almost gone. No greater misfortune, not even the misfortunes of war, has come to the human race than that of individual effort, and this is especially true in agriculture. Through the ages each farmer has been obliged to fight his own battles with pests and soil and climate conditions. What waste of wealth this system has wrought. What waste of energy it has caused. What slavery it has entailed on successive generations. What desertions from the land it is responsible for. What congested misery in cities it has produced. No, the day

for individual effort is fast passing away. Collective effort is the new order.

In concentration of capital and labor and management, and in commercial botany, entomology, chemistry and cultivation of the soil the planters of these Islands have set an example for the world. What the planters' experiment station is to the individual planter, the model farm will be to the small farmer. All classes of men are interested, whether they know it or not. Greater production and better products mean as much to the business man and the professional man as to the farmer. It is simply a matter of all men knowing this on the one hand, and that the agricultural colleges are the source from which must come the science of agriculture on the other hand; and then all men will demand more agricultural colleges, better equipment for them, and fuller service from them.

This all men are learning with an intensity of purpose that no thoughtful man can misunderstand or fail to appreciate.

SISAL AND ITS PRODUCTS.

Mr. Wm. Weinrich, Jr., then delivered a most interesting lecture on sisal and other commercial fibres, showing samples of the products from various parts of the world. Mr. Weinrich began his address with a short sketch of the history of sisal. The plant was introduced from Yucatan, where it first came into use, to Florida in 1836, and from Florida was brought to the Hawaiian Islands in 1893. A peculiar difference, as shown by the speaker's samples of the plant, was that the sisal from Yucatan was spiney along the edges, and of smaller leaf than the Hawaiian. This gave the island product the double advantage that it was easier to handle, so that laborers could work in it with less trouble, and it had also a longer fibre, which increased its commercial value. On the other hand, the life of the Hawaiian plant was only from eight to ten years, while the Yucatan lives from sixteen to twenty.

Mr. Weinrich said that he was now engaged, with the great Burbank, in an effort to produce a longer-lived sisal with the advantages of the Hawaiian product as to lack of spines and the longer leaf. He said it was remarkable, in this connection, that all the young plants had the spines on the edges, but that in Hawaii these disappeared as they grew older.

Continuing his address, Mr. Weinrich corrected a popular error

by saying that it was not true that stoney and arid lands were best adapted for the growth of sisal. On the contrary, while sisal would grow and thrive on stoney and arid lands, it grew and thrived better on rich lands that were better watered. The object was to produce a long, clean, white fibre, with some strength. That was what the cordage men wanted. The sisal grown on the richer lands, with more rainfall, gave the longer, cleaner and whiter fibre.

fibre. And Mr. Weinrich showed samples to prove what he said.

The long leaf varieties were better, because they not only produced a longer fibre, but took no more labor in handling than the short leaf kinds. As to the planting, experiments at the plantation at Sisal have convinced him that it was better to set the plants about nine feet apart each way.

Mr. Weinrich explained the process of getting the sisal fibre from the leaf by machinery, and showed samples of rope and paper and mattress stuffing made from sisal, the paper and mattress stuffing being from the waste that the decorticating machine did not save. He said that the best fibre was made from sisal by hand, and that in Yucatan hammocks made from this class of fibre sold for their weight in silver. The people of Yucatan, however, were very jealous of their industry, and it was almost impossible to get plants from them. They would scald them before shipment, so that they would not grow. Heat was the greatest enemy the sisal had. Here in Hawaii there were no pests that harmed it, although they had a beetle in Yucatan that killed the plants. The speaker explained the remarkable fecundity of the sisal, one plant producing between 2000 and 3000 young ones from its bloom stock, besides any number of suckers each year.

In conclusion, Mr. Weinrich exhibited a number of fibres from the agave americana, and the sansiveria, which latter would produce a fabric as fine as the celebrated pina cloth of Manila. He showed samples also of Manila hemp fibre, and fibres of divers sorts from all parts of the world, demonstrating that there was room in Hawaii for the development of a most important industry.

An interesting general discussion followed his paper, and the Institute then adjourned.

NOTES FROM THE DIVISION OF ENTOMOLOGY OF
THE BOARD OF AGRICULTURE AND FORESTRY.

BY JACOB KOTINSKY.

I was very much interested in the letter of Dr. Walter H. Evans, in the January (1906) number, relative to the "green-bug" (*Coccus viridis*) on lemon trees in Hawaii. It is interesting to note that the learned Doctor bases his criticism upon a newspaper clipping. Through an oversight the newspaper representative was not supplied with a copy of the report as read before the Board, and as a result there is considerable discrepancy between the newspaper report and that given in the December (1905) "Forester." But Dr. Evans is evidently not entomologist enough to have realized that the green scale does not attack vanilla; it is not surprising therefore that he did not realize the other inaccuracies of the newspaper story.

The facts of the case are clearly set forth in the report as published in the December number of the "Forester." That report, however, does not contain specific references to or quotations from Part III of "Coccidae of Ceylon," published by Mr. E. Ernest Green, the Government Entomologist of Ceylon, and author of the species of scale insect in question, upon which the statements concerning the relation of the "green-bug" to coffee in Ceylon were based. These were not deemed necessary to include in the published report. It is surprising though that Dr. Evans, who seems to have made an effort to include references to all authorities on the subject, should have omitted quoting this eminent authority, who is one of the best living authorities on scale insects, and who has made a thorough first hand study of the insect in the field. Was the omission due to oversight or convenience? It is a notable fact that in the work referred to, issued in 1904 and written in 1903, Mr. Green devotes four pages to *Coccus viridis*, nearly three of which consider its economic aspect, while an average of not more than one page is allotted to each of the other species treated, and there are thirty-two of them. This is what the author says of the "green-bug": **

** Coccidæ of Ceylon, Pt. III, pp. 200-203.

"Habitat.—Originally noticed on coffee (both Libernian and Arabian), but now almost omnivorous. Some of the better known plants upon which it occurs are: *Cinchona succirubra* and *officinalis*, *Citrus* (various species), Tea (occasionally), *Psidium guyava*, ('guava'), *Manihot seara*, *M. Para*, ('para rubber'), *M. utilissima*, ('tapioca'), *Gardenia*, *Ixora*, *Plumiera*, and numerous garden shrubs. Amongst indigenous plants, *Antidesma bunius*, *Hiptage madablota*, *Callicarpa lanata*, *Moesa indica*, and several species of *Loranthus*, may be mentioned. The insects, in all stages, are crowded on—usually the under surface of—the leaves and on the young shoots of the plants, more frequently along the mid-rib and veins.

"'Green-bug' has proved such a scourge in Ceylon, being *practically responsible for the final abandonment of coffee cultivation over the greater part of the planting districts*,* that a short account of its origin and ravages must be added to the bare description given above.

"*Lecanium virida*, popularly termed "Green-bug," first attracted attention in Ceylon in the year 1882, when it was already doing considerable damage to coffee in the Matale district. The pest rapidly extended its area, and spread through all the districts of the Central Province within three years. In 1886 it completed its conquest by appearing in the Badulla district of the Province of Uva.

"The bug attacks with indifference both vigorous and weakly trees, but its effect is markedly different in the two cases; for, though leaves of robust trees become thickly infested by the insects, and blackened by the consequent fungus, they do not fall off, but the plant continues to make fresh growth and retains a fairly healthy appearance. Weakly trees, on the contrary, are almost completely denuded, none but the two or three terminal leaves on each twig remaining. The shoots become dry and hide-bound, and no fresh wood is formed. Naturally such a condition results in a total loss of crop.

"Unfortunately, at the time of the invasion, our coffee had been weakened by long-continued attacks of 'leaf disease' (*Hemileia vastatrix*). Moreover, the prevailing system of cultivation resulted in the loss of the surface soil, so essential to the health of the coffee plant, in all but the most favored situations. The

* The italics are mine.

further tax upon its strength induced by these myriads of sap-imbibing insects proved too great for the plant, with the result that thousands of acres of coffee land were abandoned or replaced by tea. Some idea of the collapse of the coffee industry may be obtained by comparing the annual export of coffee during the period of attack. In 1881, 452,000 cwts. were shipped from Ceylon. In 1891 this figure had fallen to 88,780 cwts. While, during the past year (1902), the total scarcely exceeded 10,000 cwts.

"It must not be supposed that no efforts were made to check the invasion. When the pest first appeared on any estate, individual plants and small patches of affected trees were frequently cut out and burned. But nothing stayed the progress of the invader. The fact is, the insect being an inconspicuous one, by reason of its color and small size, it was not noticed until it had established itself in sufficient force to defy all efforts at extermination. All the old remedies that had obtained a (usually spurious) reputation as effective against the old brown bug were tried without success. Affected trees were swathed in freshly cut 'Mana grass' (*Andropogon nardus*). They were dusted with dry lime and wood ashes. But all to no effect. Following out some previous experiments with coal-tar applied to the roots, the writer applied dilute phenol and carbolic powder to the soil below the trees. The former application was at first thought to have proved successful (see Report on Green Scale Bug, 1886, footnote to page 3). But subsequent and more extensive experiments, carried out in the same way, negatived the earlier result. The original experiment was on too small a scale to provide a proper test. Lime and water, applied as a thin whitewash, by hand, killed every bug with which it came in contact; but it was found impossible to apply it in a sufficiently thorough manner, and the process was too costly in labor, when large acreages were to be treated. The same remark applies to all other liquid applications. They were both costly and inefficient. Many fancied cures owed their reputation to the death of insects from natural causes. For, quite from the commencement, the pest had its periods of increase and decrease. These periods vary in different parts of the island according to the prevailing weather. The bug flourishes best during the time of fine weather interspersed with light showers. It objects to extremes, and usually decreases both in the very wet weather and during times of excessive

drought. In districts subject to a heavy southwest monsoon, the pest is at its height from the middle of March to the middle of June, when it is checked by the continuous rains. There is a recrudescence from September to January, when it again decreases during the dryest months. On the other side of Newara Eliya, I am informed that the bug usually appears towards the end of April, and reaches a climax in October or November. If there is any very wet weather in the mean time, it temporarily declines, but flourishes in times of light rain with intermediate sunshine, and disappears almost completely from December to April.

"The periods of decrease are marked by the death of fully 90 per cent. of the insects from an epidemic fungal disease. The scales shrivel and become covered with a greyish-white fungus, which extends as a delicate fringe all round them. Dr. A. Zimmermann, then of the Botanic Gardens, Buitenzorg, Java, described this fungus under the provisional name of *Cephalosporium lecanii* in one of the circulars of his department. Dr. Zimmermann informs me that he has been experimenting with this fungus with a view to obtaining a culture that can be applied as a spray, but I have not yet heard whether success has attended his attempts. In Ceylon the fungus seems to be widely distributed, but depends upon climatic conditions for its proper development. It appears to be readily communicable by direct contagion in Ceylon. But material sent to Mr. Newport, in Southern India, failed to induce the disease in 'Green-bug' there. The weather in India at the time was not favorable for the experiment. I am inclined to think that this grey fungus has been gradually increasing and that its effect in reducing the numbers of the bug is more marked year by year. * * * * *

"From the sudden appearance of the pest and its rapid extension, it is almost certain that the insect is an introduced species, and it seems probable that the Libernian coffee plant may have been the vehicle of introduction. *Lecanium viride* has recently been recorded from Africa by Mr. R. Newstead from Lagos, West Africa. It is true that Mr. Newstead considers that the African insect is a distinct variety, but scarcely sufficient material was examined to establish that fact."

Granting that *Hemileia vastatrix* was principally responsible for the devastation of coffee in Ceylon, it does not follow that *Coccus viridis* could not have accomplished the task unaided. In

view of the facts given by Mr. Green there is every reason to believe that such would have been the case. There seems also some basis to believe that the bug was responsible for the dissemination of the fungus. The two coffee enemies probably aided each other materially. While our *Cercospora coffeicola* does not seem to be as injurious as was *H. vastatrix*, who can tell what its effects would have been when assisted by the "green-bug?" Nor, as stated in my report, is the fungus disease of the bug, referred to by Mr. Green and Dr. Evans, known to exist in Hawaii.

And finally, as to the practicability of kerosene emulsion or any other spray against an enemy of coffee in Hawaii: Had Dr. Evans seen the conditions under which coffee grows in Kona, for example, he would have not ventured to offer the kerosene emulsion remedy. As much coffee grows (wild, uncultivated, I mean) in Kona, as is under rational cultivation. Should the "Green-bug" have gained a foothold in Kona, the most effective wash would have been no more practicable there than in the sugar cane fields against the leaf hopper.

Dr. Evans would have profited either by reading the December (1905) Forester or by consulting an entomologist before writing his opinion.

*THE FARMERS' INSTITUTE OF THE TERRITORY OF
HAWAII.*

Honolulu, February 17, 1906.

Editor, The Hawaiian Forester and Agriculturist, Honolulu.

Dear Sir:—At a special meeting of the Executive Committee of the Farmers' Institute of Hawaii, on the 13th inst., held to consider our Delegate's suggestions in regard to securing soil surveys of the Hawaiian Islands, and also the services of a tobacco expert to assist in establishing that industry in Hawaii, it was voted that a petition be forwarded to the Hon. Secretary of Agriculture at Washington, requesting that he use his efforts to secure for our Territory, the desired assistance.

Herewith inclosed, please find copy of letter forwarded to Secretary Wilson, by Manchuria as mail, Feb. 14, 1906.

Respectfully,

F. G. KRAUSS,
Secretary Farmers' Institute.

February 15th, 1906.

Hon. James Wilson,

Secretary of Agriculture,

Washington, D. C.

Dear Sir:—Our Delegate to Congress, the Hon. J. K. Kalanianaʻole, desiring to further all proper efforts for the improvement and diversification of the industries of our Territory, advises us, under date of January 4th, 1906, of his consultation with you in regard to securing soil surveys of at least a part of each Island in the group.

We are informed that you have promised favorable consideration to the matter, and further, should you decide that this work can be extended to Hawaii, you will follow it up by sending a tobacco expert to establish that industry on a firm basis.

Appreciating the great benefits that would result to Hawaii by such aid from the United States Department of Agriculture, the Farmers' Institute of the Territory of Hawaii respectfully and earnestly petition the Hon. Secretary of Agriculture to use his best efforts to secure for our Territory as complete a soil survey as possible for each of the several Islands forming the Territory of Hawaii, and also to assign a tobacco expert to these Islands to assist in establishing the tobacco industry, in which the Hawaii Experiment Station, with Territorial aid, has already made so favorable a beginning.

Trusting that this petition for the extension of Hawaii's agricultural resources will meet with your favorable consideration, we are,

Respectfully yours,

JARED G. SMITH,

President.

PEARLEY L. HORNE,

ALEXANDER CRAW,

F. G. KRAUSS,

Executive Committee.

REPORTS OF THE SUPERINTENDENT OF ENTOMOLOGY.

Honolulu, T. H., January 17, 1906.

Board of Commissioners of .

Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—Since my last report to you on the 4th inst., sixteen steamships and sailing vessels arrived in port from outside the Territory, having on board 2,709 packages of fruits and vegetables and five cases of plants. Twelve packages of mail material were examined. One hundred and forty (140) boxes of apples infested with scale insects were returned to California and six crates of celery was burned as it was attacked by "cut worms."

Ten shipments of oranges (50 cases) from China were destroyed by fire as they were found infested with scale insects and several of the lots with a new species of fungus disease, a sample of which I submitted to Dr. N. A. Cobb, the pathologist of the Hawaiian Sugar Planters' Association, who stated that it was new to him and was a good thing to keep out. He will make a thorough examination when he has an opportunity and report later.

Respectfully submitted,

ALEXANDER CRAW,
Supt. of Entomology and Inspector.

Honolulu, February 7, 1906.

Board of Commissioners of

Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—Since my report of the first two weeks of Janu-

ary I have to report the arrival of fourteen steamships and sailing vessels from outside the Territory.

We found thereon five thousand four hundred and three (5,403) packages of fruits and vegetables, twelve (12) cases, boxes and bales of trees and plants and seven (7) packages by mail.

In my last report to you I should have stated that on January 9th, Mr. George Compere, beneficial insect collector for the State of California, passed through Honolulu on the S. S. "Sierra" from Australia on his way to San Francisco, after having visited the Orient. He was rushed for time, but I made it my duty to drive him through Honolulu and its suburbs, calling his attention to our most serious introduced insect pests, so that should he find either in his future travels he can make a search for their natural checks. In correspondence with Mr. Ellwood Cooper, the Chief of the California Horticultural Commission, he promised to furnish this Board with colonies of parasites of the "purple scale." Mr. Compere requested me to prepare a few orange trees by establishing them in boxes or tubs and thoroughly infesting them with the following scale insects—one species to each tree—"Purple scale" (*Lepidosaphes beckii*), the "Florida red scale" (*Chrysomphalus ficus*) and the "black parlatoria" (*Parlatoria zizyphus*) are all very troublesome upon citrus and various other trees on these Islands and are comparatively harmless to such trees in China. Mr. Compere is now on his way to Southern Europe in quest of beneficial insects for California and afterwards will visit China, when we can forward the infested trees. In this way we will be more successful in introducing the parasites, rather than undertaking their importation on detached branches in cold storage. The growing tree system I successfully used a few years ago in sending internal parasites (*Scutellista cyanca*) from California to Western Australia, after several attempts had been made in the old way by sendings from California and Cape Colony. I specially called his attention to that serious pest, the "Avocado pear scale" (*Pseudococcus nipae*) and hope he may succeed in finding its enemy in his travels.

On January 18th a wardian case of economic plants arrived ex S. S. "Mongolia" from India via Hong Kong, but they were all dead, probably from cold weather encountered on the voyage near Japan. On the same steamer there arrived forty-four (44)

cases of oranges from China and as they are from a district subject to "fruit flies" and excluded from the Territory of Hawaii by your Rules and Regulations, of October 25, 1904, we destroyed them, also the cases by burning.

In my report to you of January 17th I referred to the destruction by fire of fifty (50) cases of oranges from China ex S. S. "Siberia," January 5th, infested with a new fungus, a sample of which I submitted to Dr. N. A. Cobb, Pathologist of the Hawaiian Sugar Planters' Association. He stated "that it was new to him" and "a good thing to keep out." Dr. Cobb was called to the Island of Hawaii to investigate some matters there, so has not yet had an opportunity to report upon the Chinese orange fungus.

On January 27th ex S. S. "Nebraskan" a package arrived per mail containing two lemon trees from Florida infested with "white wax scale" (*Ceroplastes floridensis*). The owner was called to see their condition, after which the trees were burned. Another package by same mail contained a plant of a new salvia upon which I found the scale *Orthezia insignis*. This is the same insect that made its appearance on the lantana on the Island of Maui and afterwards distributed over that and other Islands by the stock men to destroy that plant. The salvia was burned and an official notice sent to the owner.

Respectfully submitted,

ALEXANDER CRAW,
Supt. of Entomology and Inspector.

KEALIA FOREST RESERVE.

In accordance with the established usage of the Board of Agriculture and Forestry, the following resolution and reports in regard to the proposed Kealia Forest Reserve, in the District of Puna, Island of Kauai, are here published. The reports were approved and the resolution adopted at the meeting of the Board held on January 17th, 1906. The matter has now been referred to the Governor with the request that after the public hearing required by law, he issue a proclamation creating the reserve and

setting apart the government lands within the boundary as compartments of the reserve.

RESOLUTION.

IN REGARD TO THE PROPOSED FOREST RESERVE IN THE DISTRICT OF PUNA, ISLAND OF KAUAI.

Adopted by the Board of Commissioners of Agriculture and Forestry at the meeting held on January 17, 1906.

Resolved, That the Forest Reserve on the east side of Kauai, embracing the mauka part of the District of Puna, above a line drawn at approximately the lower edge of the existing forest across the lands of Anahola, Kamalomaloo, Kealia and Kapaa, District of Puna, Island of Kauai, as recommended by the Committee on Forestry, on January 17th, 1906, based upon the report of the Superintendent of Forestry, dated December 30th, 1905, and on a map and description prepared by, and now on file in, the Government Survey Office, be approved.

Resolved, That the Board recommends to the Governor that the Government lands within the boundaries of the proposed Kealia Forest Reserve be set apart by him, after the hearing required by law, as compartments of the Reserve.

Resolved further, That the Board recommends to the Governor that all the land within the said described boundaries be approved by him to be set apart as a Forest Reserve, subject to all private rights and titles, and that all owners of private lands lying within said boundaries be requested to co-operate with the Board of Agriculture and Forestry in reserving all of said lands for forestry purposes, in accordance with the terms of Chapter 28 of the Revised Laws of Hawaii.

REPORT OF THE COMMITTEE ON FORESTRY.

Honolulu, Jan. 17th, 1906.

To the Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—Your Committee on Forestry has had under advisement, the question of the forest reservation on the Government lands of Anahola, Kamalomaloo and Kapaa and the land of Kealia, owned by the Makee Sugar Company.

The Forester has submitted an exhaustive report with his recommendations, including also the description of the proposed reservation. Your Committee have no personal knowledge of the territory proposed to be incorporated in this reservation, but have carefully considered the report above mentioned and do approve the recommendation of the Superintendent of Forestry that this

reserve be made and the Governor be requested, in compliance with the law, to declare the same a forest reserve and set apart the portions thereof owned by the Government for such purpose, and do further approve the recommendations that the Commissioner of Public Lands be requested to make provision for the forest fence where necessary along the lower or makai boundary of the same.

Respectfully submitted,

W. M. GIFFARD,

ALFRED W. CARTER,

Committee on Forestry.

Mr. L. A. Thurston, the third member of the Committee, absent, in California.

REPORT OF THE SUPERINTENDENT OF FORESTRY

December 30, 1905.

Committee on Forestry,

Board of Commissioners of

Agriculture and Forestry,

Honolulu, Oahu.

Gentlemen:—I beg to submit herewith a report with recommendations, upon the proposed Kealia Forest Reserve on Kauai.

In July, 1904, I prepared a preliminary report upon the question of creating a forest reserve in the north end of the Puna and east end of the Koolau Districts, on the Island of Kauai, better described perhaps as embracing the forest lands lying back of the Kealia Plantation. Owing to the fact that certain descriptions were not available no action was then taken on the report, nor has there been since. I am now prepared to submit this as a final report upon the Kealia Forest Reserve. It is based in part upon the information contained in my preliminary report and also upon other data obtained since that time; the whole being largely the outcome of personal examinations made on the ground by me in May and June, 1904, and in June, 1905.

LANDS INCLUDED.

The proposed Kealia Forest Reserve includes portions of the lands of Anahola, Kamalomaloo, Kealia and Kapaa. Of these Kealia belongs in fee simple to the Makee Sugar Company, the

owner of the Kealia Plantation. The others are government lands now under lease to the Makee Sugar Company. On all three of the lands the present leases are within two years of expiration, the dates on which they run out being as follows:

Kamalomaloo, March 29, 1907; Anahola and Kapaa, May 1, 1907. Anahola and Kamalomaloo adjoin one another and lie to the north of Kealia, which separates them from Kapaa. Under the former land classification Anahola and Kapaa were "crown" lands, Kamalomaloo a "government" land.

The area within the forest reserve boundary described below is for the several lands, as follows:

Anahola	}	5051 acres.
Kamalomaloo			
Kealia	2550	"
Kapaa	2334	"
Total			9935 acres.

PURPOSE OF THE RESERVE.

The forest problem in the north end of the Puna District on Kauai is to so protect the natural forest covering the watershed that the water in the streams draining the area may be made to do its full duty through irrigation, in the development of the fertile agricultural land below.

At present use is made of the greater part of the water that can be got out of the streams at an elevation sufficient to permit the irrigation of the cane fields. The water that develops below the water heads, from springs or seepage, with that in the streams, is used on the rice fields and taro lands at the lower levels. Owing to the fact that the several lands mentioned above vary in elevation, it often happens that the water from a given stream can be used to better advantage on other lands than on those naturally tributary to that stream. For example, under the present arrangement the Anahola water is in part used for irrigating Kealia fields, which part of the Kealia water goes to Anahola.

Experience has shown the best paying crops that can be got from the lower lands on the east side of Kauai, to be sugar cane and rice. Up to now the sugar lands have been handled by a single corporation. In future their disposition may be different, but whatever may be the outcome of the present plans for settle-

ment, there will remain the need for an adequate and assured supply of water for irrigation.

The object of the proposed Kealia Forest Reserve is by protecting the forest on the mountain slopes and in the upper valleys of the watershed, to assist in maintaining the present desirable conditions of regular flow in the streams and the retention of at least a part of the storm water.

TOPOGRAPHY.

For the most part the area within the boundary of the reserve is of such rugged and broken topography that its use for anything but forest is out of the question. And the few places within the boundary where there are flats, as for example the area just within the forest line on the land of Kamalomaloo, are not suited for agriculture. On this particular plot the soil is cold and sour, making it unfit even for grazing land. This area is chiefly of value as containing several reservoir sites, one of which has been purchased by the plantation and developed by the erection of a substantial dam.

On this and the few other similar areas and on the bare ridges on the land of Kealia, certain kinds of trees might however be grown, from which, it is believed, better returns could be got than from any other use to which these areas could be put. The afforestation of such places would in time provide a source of wood for various purposes, including fuel, a need that will be strongly felt with a growing population on the lands below. The exclusion from the reserve of all land rightly to be classed as agricultural has been kept constantly in mind in drawing the boundary, consequently the reserve includes only forest land.

THE FOREST.

The forest in the Kealia Reserve is of the type common on the lower mountains of the Territory—a dense stand in which Koa (*Acacia Koa*) and Ohia Lehua (*Metrosideros polymorpha*) predominate, in mixture with a considerable number of other species. Under the canopy of the trees are various vines, creepers and other undergrowth, while the forest floor itself is covered with a dense mat of brakes, ferns and mosses, the whole so interwoven as to be almost impenetrable, except as one cuts his way

through with a cane knife. It would be hard to imagine a cover of vegetation better adapted for the conservation of water than this. It is indeed, for this climate, the ideal protection forest.

BOUNDARY RECOMMENDED.

Following and as a part of the examination made by me to determine the location of the forest line and to study the local conditions on the ground, I have discussed the matter with Mr. J. W. Pratt, Commissioner of Public Lands; with representatives of the Kealia Plantation, including Col. Z. S. Spaulding and Mr. G. H. Fairchild, the latter being also the local district forester, and with Mr. F. E. Harvey, of the Survey Office, who from investigations incident to comprehensive surveys of the government lands in northeastern Kauai, has become very familiar with the lands and general conditions obtaining in this section. As a result of this study the lower boundary of the Kealia Reserve was laid out on the ground by Mr. Harvey, under my direction, the important points along its course being marked by him. As stated above, this line was run with the idea of excluding all land suited for agricultural use. Its location has been approved by the Land Commissioner.

Briefly, the lower boundary of the Kealia Forest Reserve may be described as follows: Beginning at a point on the Aliomanu-Anahola boundary at the end of the Kolau Ridge, the line skirts the foot of the bluff, follows up the Anahola River to a point near the concrete dam and waterhead, thence up the bank and across the lands of Anahola and Kamalomaloo a little below the edge of the existing forest to the hill in Kealia called Puu Kinui, thence to Puu Lawaii, crossing the Mimino Gulch near the new (1905) dam and reservoir, thence following the foot of the steep slope on the north side of the Kapahi stream to the Moalepe gulch to a point near a place called Pohakuiki, thence to and following the ridge forming the Kapaa-Waipouli boundary into the mountains.

The upper line of the reserve follows the ridges which make the main divides between the watersheds on the north and east sides of the island, it being part of the way identical with the mauka boundary of the Halelea Forest Reserve, proclaimed in August, 1904.

The location of the proposed boundary of the Kealia Forest Re-

serve is shown on the accompanying sketch map, but the official maps of this reserve boundary are the large maps of Kapaa and Anahola and Kamalomaloo prepared by Mr. F. E. Harvey, on file in the office of the Territorial Surveyor, respectively Registered Maps Nos. 2324 and 2282.

The detailed description of the line prepared by Mr. Harvey is attached hereto and forms a part of this report. Especial attention is called to the elevations which are given for all the principal points along the line.

ADDITIONS TO THE RESERVE.

It may perhaps be noted here that it is my intention later to recommend the extension of the Kealia Reserve to join and include the area of forest which has for some years been maintained under fence as a private forest reserve by the Lihue Plantation Company. The fence of the Lihue Reserve now extends from a point near Kilohana crater on the land of Hanamaulu, to Hana-hanapuni hill on Wailua. This forest line should be continued across the lands of Wailua (government) and Oloheua and Wai-pouli (fee simple) to the point called Kainamanu on the boundary of the Kealia Reserve, described by Mr. Harvey. Before the exact location of this line can be recommended further study on the ground will be necessary and a more accurate description of the line than is now at hand.

RECOMMENDATIONS.

For the reasons above set forth, I recommend that the Board of Commissioners of Agriculture and Forestry approve the Kealia Forest Reserve as described in this report and request the Governor, after the required hearing, to declare and recommend by proclamation, in accordance with law, the area herein described as a forest reserve, and to set apart as portions thereof the government lands embraced within the reserve boundary, to-wit: Anahola and Kamalomaloo, 5051 acres, and Kapaa, 2334 acres.

I recommend that the Commissioner of Public Lands be requested to make provision for the building and maintenance of a forest fence, where necessary, along the lower reserve boundary, by the insertion of fencing clauses when the lower portions of the above named lands are again leased.

I further recommend that steps be taken to secure the co-

operation of the Makee Sugar Company, that the portion of Kealia lying within the reserve may be administered with the other lands to the best interests of the reserve as a whole.

OFFICIAL DESCRIPTION OF THE BOUNDARY.

Following is the technical description of the boundary of the Kealia Forest Reserve, prepared by Mr. F. E. Harvey of the Government Survey:

[The technical description of the boundary is here omitted, as it is somewhat lengthy and will be published later in this magazine as a part of the proclamation creating the reserve.]

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

EWA FOREST RESERVE.

At the meeting of the Board of Commissioners of Agriculture and Forestry, held on February 7, 1906, the reports of the Committee on Forestry and of the Superintendent of Forestry on the proposed Ewa Forest Reserve on Oahu, were approved, and a resolution in regard thereto adopted. Following the usage of the Board the resolution and reports are published herewith:

RESOLUTION.

IN REGARD TO THE PROPOSED EWA FOREST RESERVE.

Adopted by the Board of Commissioners of Agriculture and Forestry on February 7, 1906.

Resolved, That all of those certain lands in the Ewa Basin, on the Island of Oahu, bounded on the southwest by approximately the lower edge of the existing forest, on the northeast by the crest of the Koolau Mountains, on the east by and including the land of Halawa, District of Ewa, and on the west by and including the land of Wahiawa, in the District of Waialua, as recommended by the Committee on Forestry, on February 5th, 1906, based upon the report of the Superintendent of Forestry, dated January 16th, as more particularly appears by and on a map and description now on file in the office of this Board, and made a part

hereof, be approved as a forest reserve, to be called the "Ewa Forest Reserve."

Resolved, That the Board recommends to the Governor that the Government lands within the boundaries of the said proposed Ewa Forest Reserve be set apart by him, after the hearing required by law, as compartments of the said Reserve.

Resolved further, That the Board recommends to the Governor that all the lands within the said described boundaries be approved by him to be set apart as a Forest Reserve, subject to all private rights and titles, and that all owners of private lands lying within said boundaries be requested to co-operate with the Board of Agriculture and Forestry in reserving all of said lands for forestry purposes, in accordance with the terms of Chapter 28 of the Revised Laws of Hawaii.

REPORT OF THE COMMITTEE ON FORESTRY.

Honolulu, T. H., Feb. 5, 1906.

Board of Agriculture and Forestry,

Honolulu T. H.

Gentlemen:—Your Committee on Forestry have received from Mr. R. S. Hosmer, Superintendent of Forestry, a report upon a proposed forest reserve along the west slope of the Koolau Range, extending from the boundary of the Honolulu District to and including the land of Wahiawa, on the Island of Oahu.

The proposed reserve lies entirely within the Ewa District except two lands, Waianae-uka, which is in the District of Waianae, and Wahiawa, which is in the District of Waialua.

The mauka boundary is the crest of the Koolau Range of mountains and the makai boundary is a line drawn along approximately the present lower edge of the forest and ranging from an approximate elevation above sea level of from 800 to 1000 feet.

The total area of the proposed reserve is approximately 28,550 acres, of which approximately 4,759 acres is government land not now under lease and available for immediate segregation as a forest reserve.

With very limited exceptions the land lying above the forest line is so broken with deep gulches with almost precipitous sides, that the land is unavailable for agricultural purposes and of but little value for pasturage purposes. Even if the land proposed to be reserved were much better suited for cultivation and pasturage than it is, your Committee are of the opinion that it would be wise economy to reserve it for forest purposes, as the lands lying

in the Ewa Basin are of value almost solely by reason of the water which originates in the area proposed to be reserved.

The present annual output of sugar from the district, which depends upon this water shed for almost its entire water supply, is approximately \$6,000,000. The sugar cane is raised in the district referred to only up to an elevation of 600 feet above sea level. The area between this level and the proposed forest reserve is pineapple land of the highest quality. There is now under cultivation in pineapples upwards of 1000 acres, with every indication that that area will be very rapidly increased.

A very large proportion of the bananas and rice produced in the Territory also comes from the same district.

Your Committee consider the proposed reserve to be the most important water shed of its size in the Territory. They are further of opinion that not only should the reserve be made, but that an earnest attempt should be made, at as early a date as practicable, to reforest the slopes below the present forest line in order to, as far as possible, conserve the rainfall and prevent the rapid flow to the sea of the storm water so as to make the same available for longer periods between rains.

It is the belief of the Committee that the heartiest co-operation may be expected from the owners and lessees of private lands lying within the proposed reserve, not only in connection with establishing the reserve, but in connection with the proposed reforestation. Mr. Low, manager of the Honolulu Plantation, has already volunteered to carry out a tree-planting program on the lands back of his plantation, not only within but below the proposed forest lines. Such tree-planting program should receive every possible assistance from this Board.

Your Committee are of opinion that the reserve recommended by Forester Hosmer should be recommended by the Board to the Governor for formal reservation as a forest reserve, and recommend to the Board the adoption of a resolution to that effect.

Yours respectfully,

L. A. THURSTON,
ALFRED W. CARTER,
W. M. GIFFARD,
Committee on Forestry.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

January 16, 1906.

Committee on Forestry,
Board of Agriculture and Forestry,
Honolulu, Oahu.

Gentlemen:—I have the honor to submit herewith a report, with recommendations, upon the proposed forest reserve on the western slope of the Koolau Mountains in the Ewa Basin, on Oahu. The report is the outcome of a series of personal examinations made at different times during 1904 and 1905, when portions of the reserve were visited and the location of the proposed boundary considered on the ground.

The first active steps toward the creation of a forest reserve in the Ewa Basin were taken some three years ago when Mr. W. F. Dillingham, the District Forester for Ewa, submitted to Governor Dole a report, accompanied by an outline map, suggesting a forest reserve, the boundaries of which closely correspond with those recommended below. The report and map are now on file in my office.

AREA INCLUDED.

The area included in the Ewa Forest Reserve embraces the mauka portions of the lands lying between the western boundaries of Moanalua and Wahiawa. The lower boundary follows approximately the lower edge of the existing forest for a good share of the way, save that back of the Honolulu Plantation the reserve line is somewhat lower down the slope than it is further to the north. The upper boundary of the reserve is the main divide along the crest of the Koolau Mountains. The lands included lie for the most part in the Ewa District but two, Waianae-uka and Wahiawa, are, respectively, in the Districts of Waianae and Waialua. The waters from the last named lands flow toward Waialua, not toward Ewa.

The reservation of the remainder of the Koolau forest tributary to the Waialua Basin only waits the completion of a description of the forest line. This in hand, the reserve will be extended to cover the area from Wahiawa to Waimea, all privately owned land.

OBJECT.

The purpose of the Ewa Forest Reserve is to insure the continuance of the forest on the Koolau Mountains and to increase its efficiency as a protection forest by bringing the area under a system of forest administration.

GENERAL CONSIDERATIONS.

The Ewa Basin contains some of the most productive land in the Territory. The cane fields of the three large sugar plantations of Ewa, Oahu and Honolulu, together cover an area of a little over 20,500 acres. In 1905 70 per cent. of the sugar produced on Oahu, or 20 per cent. of the entire output of the Territory, came from these three plantations. The figures for the two preceding years are only slightly different; the yield in 1904 being 66 per cent., in 1903 69 per cent. of the Oahu output—and of the total Hawaiian crop, 18 per cent. for 1904 and 19 per cent. for 1903.

All of this great and productive area of sugar land in the Ewa Basin is dependent on irrigation, for sugar cane cannot be profitably grown on this part of Oahu without an abundant supply of water.

The water for irrigation comes in part from streams rising in the Koolau Mountains and the Waianae Hills, through the diversion of the natural flow and the impounding of storm water, and in part from artesian wells. The greater part of the surface water is developed on the Koolau, rather than the Waianae side of the Basin, and although the geology of Oahu has not yet been fully worked out, it appears that the water-bearing strata tapped by the artesian wells also depend largely for their supply on the precipitation on the Koolau Mountains.

It is therefore important that as much as possible be done to preserve and protect the forest on this important watershed. If the steep slopes of the Koolau Mountains are covered with vegetation much of the water falling as rain can be retained for possible use, whereas were the slopes bare, a large share of the precipitation would escape as flood water, not only evading its duty and being lost to use, but doing damage along its course as well.

On reaching the edge of the forest many of the smaller streams now dwindle away until only the dry beds are left. If the forest came further down the slope the water in the streams would also be found lower down. This is not because the rainfall would be increased, but because forest is a better cover for a watershed than is open grazing land, because it helps to keep the flow in the streams regular and to prevent loss through rapid run off and, to some extent, evaporation. There is some evidence tending to show that formerly the area of light showers reached further down the mountain than it does now. Whether or not a heavy forest coming as far down as the present forest fence would assist in drawing the rain-bearing clouds further down the slope cannot be said, but the influence which the forest does exert on the water that actually reaches the ground is direct and tangible.

OWNERSHIP.

By far the greater part of the area making up the Ewa Forest Reserve is in private ownership. The three government lands within the boundary are Aiea, Waimano and Wahiawa. Aiea is under a lease which runs until January 14, 1912. The area within the forest reserve is 383 acres. The lower portion of Waimano is also under lease, but the area above the existing forest fence was reserved, to be held as forest, when the present lease was made in 1898. One of the provisions of this lease is that the forest fence be built and maintained. The area above the fence is given in the Land Office List as 781 acres. On Wahiawa the leasehold covers the water rights only, so that the land itself may, under the law, be set apart as a compartment of the reserve. Such action would interfere in no way with the water lease. Indeed, the essential reason for the creation of the Ewa, like most of the Hawaiian forest reserves, is that the water from the watersheds they cover, may be conserved for proper utilization. The area of Wahiawa is 3978 acres.

Below is given a table showing the names, owners, and lessees of the lands of which portions are included in the Ewa Forest Reserve, with the dates on which the existing leases expire.

It should be noted that the Honolulu Plantation Company holds

sub-leases of the area suitable for sugar cane on the lower portions of the following lands: Halawa B, Halawa A, Aiea, Kalauao, Kaonohi, Waieli and Waimalu. Similar sub-leases are held by the Oahu Sugar Company for the cane area on the lands of Waiau, Waimano, Manana, Waiawa and Waipio. In most cases the leases of cane land cover only the area below the 650 foot level, the section between that elevation and the forest reserve boundary remaining in the control of the owner or original lessee.

It should be further noted that upon the expiration of the existing leases on Halawa A, Kalauao, and Kaonohi, a new lease to the Honolulu Plantation Company, running till September 1st, 1940, goes into effect, by which the area above the forest line proposed in this report, is reserved. On Waieli a new lease to run for eleven years begins on January 1, 1907, by which the forest land is reserved. New leases for long terms containing similar provisions will go into effect on Waimalu, and probably on Halawa B as well, when the existing leases run out. The lower part of Halawa B, up to the 650 foot level, is now under a long lease to the Honolulu Plantation Company, which company also holds the other leases just mentioned.

From this statement it will be seen that after 1908 the only important lands above the forest line remaining unreserved are Aiea (government), Pohakapu (Catholic Mission) and Waianae-uka (U. S. War Department), and it is possible that some arrangement in regard to them may be reached with the present lessees.

There are said to be a number of kuleanas of varying size within the reserve boundary, especially on the land of Waimalu, but apparently few of these lots have as yet been definitely located. They need not be considered further here.

In the preparation of the following table, I have received much assistance from representatives of the various companies and estates mentioned, especially from Mr. F. S. Dodge, Superintendent of the Bishop Estate. I desire here to make grateful acknowledgement for these favors.

Following is a

TABLE OF LANDS.

PORTIONS OF WHICH ARE WITHIN THE EWA FOREST RESERVE.

Name.	Owner.	Portion Within Reserve.	Lessee Portion Adjoining Reserve.	Lease Expires.
Halawa B	Queen Emma Estate	Leased	Dowsett Company	September 1, 1908
* Halawa A	Bishop Estate	Reserved (in part)	Dowsett Company	September 1, 1908
Aiea	Government	Leased	Dowsett Company	January 14, 1912
Kalaiao	Bishop Museum	Reserved	Honolulu Plantation Company	September 1, 1940
Kaonohi (an ili of Kalaiao)	Bishop Estate	Reserved	Honolulu Plantation Company	September 1, 1940
Waiehi (an ili of Waimalu)	C. M. Cooke	Leased	L. L. McCandless	January 1, 1907
Pohakapu (an ili of Waimalu)	Catholic Mission	Leased	L. L. McCandless	August 1, 1927
Waimalu	Austin Estate	Leased	L. L. McCandless	January 1, 1907
Waiau	Bishop Estate	Reserved	Oahu Railway & Land Company	July 1, 1940
Waimano	Government	Reserved	Oahu Railway & Land Company	February 22, 1919
Manana	Oahu Railway & Land Co.	Reserved	(Not leased.)	
Waiawa	Bishop Estate	Reserved	Oahu Railway & Land Company	July 1, 1940
Waipio	Ii Estate	Reserved	(Not leased.)	
Waianae-uka	U. S. Government (War Department)	Leased	Dowsett Company	January 14, 1912
Wahiawa	Government	Water rights leased	Waialua Agricultural Co. & Hawaiian Fruit & Plant. Co.	October 11, 1948

* Halawa A is reserved above a line drawn parallel to the Government road, three miles mauka of it.

. FOREST FENCES.

The existing forest fences which mark a good portion of the lower boundary of the Ewa Reserve, date back from eight to twelve years. The section across Waipio was completed during the spring of 1894, while that across the lands of Waiawa, Manana, Waimano and Waiau was built in 1898. Much of the way the fence marks the lower edge of the forest. In some places there is open land above it and occasionally, especially in the gulches, tongues of forest come further down. The fence does not follow an exact course. It was, rather, run where it could be most easily built, at about the required elevation.

Back of the Honolulu Plantation various stretches of fence built at different times follow the 650 foot contour and mark the upper line of the cane land. While not on the forest line, sections of this fence could be utilized to protect the forest reserve. In some cases, with the exclusion of cattle from the upper lands the necessity for a forest fence disappears, while in other instances a forest fence will have to be built. There are division fences running mauka on the Kalauao-Aiea and on the Halawa B-Moanalua boundaries.

THE FOREST.

The forest on the western slope of the Koolau Mountains belongs to the type which has been described in former reports of mine as being characteristic of the elevations between one and four thousand feet in the Hawaiian group. Ohia Lehua (*Metrosideros polymorpha*) and Koa (*Acacia koa*) are the most important species and predominate among the trees in mixture. With them is associated a considerable number of other trees, mainly of small size and minor importance, and also many shrubs, large ferns, climbing vines and other plants, which together form a dense mass of vegetation under the canopy of the main forest trees.

In the gulches Kukui (*Aleurites moluccana*) is a common tree, its greenish white foliage adding much to the picturesqueness of the scenery. Guava (*Psidium guajava*) and Lantana (*Lantana camara*) are much in evidence in the broader gulch bottoms and on some of the flats near the forest fence. Practically the only commercial use to which the forest is now put is the use, in

places, of the Guava for charcoal, and the occasional cutting of trees for fuel or fence posts.

When open areas have been protected for some time by the fence, there are often dense mats of the Staghorn fern or Uluhi (*Gleichenia dichotoma*), through which the Amau, and other ferns and brakes, are gradually forcing their way—the first steps in the return of the forest. On the exposed ridges and in places where the Hilo grass (*Paspalum conjugatum*) has taken a firm hold a long time must elapse before the land can again be covered with trees. Where the ferns have not been entirely stamped out the forest comes back again much more speedily.

Examinations made primarily to determine the location of the reserve boundary do not offer good opportunities for a careful study of the typical forest of the reserve. They are concerned with its borders—while to know the forest one must get back into the mountains. The necessarily brief mention made in these reports should therefore be considered only as introductory to detailed studies of the several types of the Hawaiian forest which it is expected will be made after the more pressing work of creating reserves and getting the system of forest administration under way, is further advanced.

TREE PLANTING.

Mr. James A. Low, Manager of Honolulu Plantation, has made a proposition to the Bishop Estate and other owners of land back of his plantation, to plant parts of the area between the edge of the existing woods and the upper line of the agricultural land, with forest trees. The exact details of this offer are not in hand, but in general terms Mr. Low's idea is to systematically establish a forest plantation on the open land now used for stock grazing. The plan is perfectly feasible and the forestation of this section would unquestionably be of material benefit to the Honolulu Plantation.

It need hardly be said that the Division of Forestry is keenly interested in Mr. Low's proposal and stands ready to assist in carrying out the plan in every possible way.

In this connection I wish to record my appreciation of the interest taken by Mr. Low in the establishment of the forest line recommended in this report. By Mr. Low's direction a number of points on the lower boundary of the reserve, back of the

Honolulu Plantation, were carefully located by the then plantation surveyor, Mr. George J. Wagner, who also prepared a map of this section, showing various data of value in this connection.

EXTENSION OF THE RESERVE.

An extension of the Ewa Forest Reserve could with advantage be made on its southern border to take in the mauka portions of the lands of Moanalua and Kahauiki. Already a forest fence following the Halawa B-Moanalua boundary and crossing the land of Moanalua a little below the late Mr. S. Ed. Damon's mountain house, "Top Gallant," protects the forest and makes it a private reserve. This area is not now included in the Ewa Reserve because no description of the line is at present available. It may later be recommended.

THE BOUNDARIES.

In laying out a forest line across private land, the desire of the owner has naturally much to do with its location. In general the attitude of those owning land within the Ewa Forest Reserve is well indicated by the construction of the existing fences and the provisions regarding forest reservation and protection which are embodied in all the new leases. Without exception the owners of the private lands are in favor of forest reservation, for they appreciate the need and importance of safe-guarding the Ewa watershed.

It remains, however, to bring this area under a definite and comprehensive system of forest management before the objects for which it is reserved can be fully attained. Such a system, through the efficient protection of the existing forest and the extension of the forest cover through planting, where that may be needed, would put the Ewa Reserve to its best use and increase its value to those already benefited by it.

The fact that a forest fence has already been built is a strong argument for its adoption as the lower forest line, and although the reserve boundary between Waimalu and Waianae-uka might in some places be drawn with advantage lower down, I believe the fence line meets so many of the requirements that it is doubtful, all things considered, if a better location could at this time be made. The location of the forest line across the lands back of

the Honolulu Plantation has been the subject of careful study made on the ground by me in consultation with representatives of the various interests involved. As here recommended the line meets with their approval.

RECOMMENDATION.

For the reasons above set forth, I therefore recommend the creation of the Ewa Forest Reserve, with boundaries as called for in the description compiled by the Government Surveyor, which accompanies and forms a part of this report. And I further recommend that if this report meets with the approval of the Board that the Governor be requested to declare the area a forest reserve, after the hearing required by law, and to set apart as compartments thereof the portion of the government lands of Waimano and Wahiawa lying within the reserve boundary.

I also recommend that steps be taken to secure the co-operation of the owners of private land within the Ewa Forest Reserve, that the reserve as a whole may be brought under an efficient system of forest management.

DESCRIPTION.

[Here follows a technical description of the boundary of the Ewa Forest Reserve, compiled by Mr. W. E. Wall, Government Surveyor. As the description is lengthy and will later be published in this magazine as a part of the Proclamation creating the Reserve, it is omitted here. The area of Ewa Reserve is 28,550 acres, more or less.]

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REVISED LIST OF SEED FOR SALE AT THE GOVERNMENT NURSERY.

The following list of seeds and plants for sale at the Government Nursery has just been issued as Press Bulletin No. 3 of the Division of Forestry, to answer inquiries frequently received from persons desiring to plant trees. It may with advantage be consulted in connection with Circular No. 1 of the same

Division, entitled "An Offer of Practical Assistance to Tree Planters."

SEED COLLECTED IN NEIGHBORHOOD OF HONOLULU.

FOREST TREES.

Common and Scientific Name.	Approximate	Price
	No. Seeds Per Oz.	Per Oz. Cents.
Koa (<i>Acacia koa</i>).....	500	15
*Ironwood (<i>Casuarina equisetifolia</i>).....	22,000	10
*Blue Ironwood (<i>Casuarina glauca</i>).....	20,000	15
Red Gum (S. W. Australia) (<i>Eucalyptus calophylla</i>)	350	50
*Yate (<i>Eucalyptus cornuta</i>).....	80,000	50
*Bloodwood (<i>Eucalyptus corymbosa</i>).....	70,000	50
*Stringybark (<i>Eucalyptus eugenoides</i>).....	85,000	50
*Swamp Gum (<i>Eucalyptus gunnii</i>).....	80,000	50
*Ironbark (<i>Eucalyptus leucoxylon</i>).....	80,000	50
*Yellow Box (<i>Eucalyptus melliodora</i>).....	80,000	50
*Leather-Jacket (<i>Eucalyptus punctata</i>).....	90,000	50
*Red Mahogany (<i>Eucalyptus resinifera</i>).....	90,000	50
*Swamp Mahogany (<i>Eucalyptus robusta</i>).....	90,000	50
*Red Gum (<i>Eucalyptus rostrata</i>).....	90,000	50
Silk Oak (<i>Grevillea robusta</i>).....	1,500	20

[The kinds starred (*) are sold in 5 and 10 cent packages.]

ORNAMENTAL AND STREET TREES.

Red Sandalwood (<i>Adenanthera pavonina</i>).....	85	25
Siris Tree (<i>Albizia lebbek</i>).....	120	25
Monkeypod (<i>Albizia saman</i>).....	150	15
St. Thomas Tree (<i>Bauhinia tomentosa</i>).....	120	25
Berria (<i>Berria ammonilla</i>).....	1,000	20
Silk Cotton (<i>Bombax ceiba</i>).....	400	25
Red Dyewood (<i>Caesalpinia sappan</i>).....	30	25
Yellow Poinciana (<i>Caesalpinia</i> sps.).....	330	25
Pink Shower (<i>Cassia grandis</i>).....	38	25
Golden Shower (<i>Cassia fistula</i>).....	150	25
Pink and White Shower (<i>Cassia nodosa</i>).....	120	25
Duranta (White) (<i>Duranta plumieri alba</i>).....	400	25
Duranta (Blue) (<i>Duranta plumieri</i>).....	400	25
*Henna (<i>Lawsonia alba</i>).....	24,000	20
Pride of India (<i>Melia azedarach</i>).....	30	10
African Locust (<i>Parkia africana</i>).....	30	10
Royal Poinciana (<i>Poinciana regia</i>).....	50	10
Pepper Tree (<i>Schinus molle</i>).....	780	20
Milo (<i>Thespesia populnea</i>).....	100	25

IMPORTED SEED.

FROM AUSTRALIA.

*Australian Ironwood (<i>Casuarina stricta</i>).....	20,000	40
*Turpentine Tree (<i>Syncarpia laurifolia</i>).....	90,000	40
*Apple Tree of New South Wales (<i>Angophora sub- velutina</i>)	1,000	50
*Black Box (<i>Eucalyptus bicolor</i>).....	90,000	45
*Karri (<i>Eucalyptus diversicolor</i>).....	20,000	60
*White Gum (<i>Eucalyptus haemastoma</i>).....	80,000	45
*Gray Box (<i>Eucalyptus hemiphloia</i>).....	90,000	45
*Ironbark (<i>Eucalyptus leucoxylon</i>).....	90,000	50
*Woolly-Butt (<i>Eucalyptus longifolia</i>).....	90,000	40
*Jarrah (<i>Eucalyptus marginata</i>).....	6,600	50
*Messmate (<i>Eucalyptus obliqua</i>).....	30,000	40
*Yellow Blackbutt (<i>Eucalyptus obtusifolia</i>).....	30,000	40
*Giant Gum (<i>Eucalyptus regnans</i>).....	40,000	50
*Weeping Gum (<i>Eucalyptus saligna</i>).....	90,000	40
*Forest Red Gum (<i>Eucalyptus tereticornis</i>).....	80,000	40

FROM CALIFORNIA.

*Blue Gum (<i>Eucalyptus globulus</i>).....	7,800	30
Black Wattle (<i>Acacia decurrens</i>).....	2,200	25
Australian Blackwood (<i>Acacia melanoxylon</i>).....	2,000	25
Cootamundra Wattle (<i>Acacia baileyana</i>).....	1,000	30
Leather-leaf Ash (<i>Fraxinus velutina</i>).....	1,400	40
Monterey Cypress (<i>Cupressus macrocarpa</i>).....	3,700	10
Redwood (<i>Sequoia sempervirens</i>).....	5,000	25
Bigtree (<i>Sequoia washingtoniana</i>).....	4,000	40
Canary Island Pine (<i>Pinus canariensis</i>).....	225	25
Scotch Pine (<i>Pinus sylvestris</i>).....	4,800	15
Seaside Pin (<i>Pinus maritima</i>).....	550	15
White Pine (<i>Pinus strobus</i>).....	2,000	20

FROM GERMANY.

Ceara Rubber (<i>Manihot glaziovii</i>).....	50	20
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PALM SEED.

		Price per 100
Red Palm (<i>Areca rubra</i>).....	30	\$1.50
Wine Palm (<i>Caryota urens</i>).....	10	1.50
Oil Palm (<i>Elais guineensis</i>).....	5	2.00
Fan Palm (<i>Latania borbonica</i>).....	12	1.00
Royal Palm (<i>Oreodoxa regia</i>).....	60	1.00
Loulu Lelo (<i>Pritchardia gaudichaudii</i>).....	8	2.50
House Palm (<i>Thrinax argentea</i>).....	120	1.00

TREE SEEDLINGS.

Beside seed there is also kept on hand a limited number of tree seedlings. The following kinds may be bought for 5 cents each:

Monterey Cypress (*Cupressus macrocarpa*).

Brazilian Rosewood (*Jacaranda mimosaeifolia*).

Longan (*Nephelium longana*).

The trees listed below are sold at 2½ cents each:

Ironwood (*Casuarina equisetifolia*).

Blue Ironwood (*Casuarina glauca*).

Lemon-scented Gum (*Eucalyptus citriodora*).

Swamp Mahogany (*Eucalyptus robusta*).

Silk Oak (*Grevillea robusta*).

Siris Tree (*Albizzia lebbek*).

Golden Shower (*Cassia fistula*).

Pink Shower (*Cassia grandis*).

Royal Poinciana (*Poinciana regia*).

Pride of India (*Melia azedarach*).

Pepper Tree (*Schinus molle*).

Packets containing seed will be sent postpaid upon receipt of price. Remittances must be made in coin or by U. S. Money Order, payable to the order of David Haughs.

Persons desiring tree-seed in large quantities are requested to place their orders well in advance.

All communications in regard to seed should be addressed to David Haughs, Box 331, Honolulu, T. H.

To stimulate interest in tree planting and to encourage the introduction and wider application of improved ways of planting, caring for and finally of cutting the trees in forest plantations, the Division of Forestry stands ready to render assistance to individuals or corporations desiring to undertake such work. Full particulars of the plan of co-operation may be found in Circular No. 1 of the Division of Forestry, entitled "An Offer of Practical Assistance to Tree Planters."

RALPH S. HOSMER,
Superintendent of Forestry.

Feb. 14, 1906.

AN OFFER OF PRACTICAL ASSISTANCE TO TREE PLANTERS.

[Issued as Circular No. 1, of the Division of Forestry, in January, 1906.]

INTRODUCTION.

Among the imports into Hawaii for the fiscal year ending June 30, 1905, wood products ranked seventh in value, the total for timber, lumber, door and window fittings, etc., and for furniture, being \$528,110. In a price list recently issued by one of the leading lumber dealers in Honolulu ordinary rough lumber, Northwest (Red or Douglas Fir) and Redwood, is quoted at from \$30 to \$35 per M., while Redwood fence posts are listed at 24 cents each. No stronger commentary is needed on the desirability of a local supply.

THE OFFER.

To assist in meeting the demand, the Division of Forestry stands ready, so far as its limited appropriation will permit, to render practical and personal assistance to individuals or corporations desiring to establish forest plantations, wood lots or windbreaks, or to do other forest work.

This assistance is given in two ways:

First, by keeping constantly on hand fresh seed of the more important native and introduced trees and also a limited number of nursery grown seedlings of the kinds most in demand; the seed and plants being sold at prices just covering the cost of collection or growing.

Second, by advice and suggestion as to the kinds of trees best adapted for the purpose, locality and situation of the person desiring to plant, and the methods to be pursued to secure the best results in the planting.

On each of the larger islands of the Hawaiian group there are considerable areas of forest, which play an important part in protecting the water sheds of the streams needed for fluming or irrigation, but unfortunately the native Hawaiian trees are for the most part not of economic importance. Where they are of value it is because of their worth as cabinet and other high class woods, rather than because they furnish construction material. To meet the ever growing demand for wood suitable

for the various purposes of domestic supply, fence posts, railroad ties, bridge timbers and general construction, not to mention fuel, which in certain districts is an important consideration, the Territory stands in great need of forest plantations of timber producing trees.

Tree planting on a large scale in this country is necessarily a somewhat expensive operation and when undertaken should be done advisedly and in accordance with a systematic plan. The purpose of the Division of Forestry in offering to co-operate with the individual planter is to stimulate interest in tree planting, and by the introduction of good methods to secure the best results in the work done. To explain the offer of co-operation is the object of this circular.

THE WORK OF THE DIVISION OF FORESTRY.

Forest work in Hawaii falls naturally under two general heads: (1) the creation of forest reserves and the establishment of a system of forest administration, and (2) the introduction and propagation of exotic trees of value to the Territory.

The forest reserve work has received first attention since the organization of the Division of Forestry and will continue to do so until the system is established and well under way. The reserves are for the most part "protection forests" on the important water-sheds and are made by setting apart areas of existing forest. While their essential object is to protect the slopes they cover, it is hoped that eventually, under forest management, the reserves may also be made to yield forest products on an economic basis.

The other main line, plant introduction, is of no less importance, but owing to the limited appropriation now available, it has for the present to take second place.

There are many areas of waste land in the Territory where forest trees could, with advantage, be planted. On almost every sugar plantation are unproductive corners and strips of land, where it is not advisable to plant cane, which could well be devoted to trees. The proper kinds being set out would in time yield good returns for bridge timbers, fence posts, railroad ties or fuel, besides in the meantime improving the appearance of the country-side. But tree planting is not restricted to the corporation or to the larger owner alone.

To the homesteader it is equally, perhaps even more important, to have a wood lot from which he can obtain supplies of wood or fuel. And further, it should not be forgotten that the sale value of a place is increased by the presence of trees about the house, the whole protected if need be by a wind-break on the exposed side.

TREE PLANTING IN THE PAST.

The recommendations of the Division of Forestry are based on what has been actually accomplished in the Territory and on technical information brought together by the members of the staff. During the past thirty years much tree planting has been done in Hawaii—many species of trees having been tried under a variety of conditions and in many localities. Some have succeeded well. Others through their failure have proved equally instructive. The planting has included road-side and ornamental planting as well as windbreaks and forest plantations made primarily for commercial returns. As a result of all this work much valuable information has been accumulated, some of which the Division of Forestry expects later to publish in the form of bulletins. At present it has not been fully compiled.

THE PLAN OF CO-OPERATION.

The Division of Forestry stands ready to give advice as to the kinds of trees best adapted for particular needs and as to the methods which should be followed to insure success, in all classes of forest-tree planting. It will also undertake for a time to give advice on road-side and street tree planting, although this is not strictly within the province of forest work.

The Division of Forestry has already in hand sufficient information so that in many instances, advice can at once be given to fully cover the needs of the applicant, particularly where only a limited area is to be planted. In other cases, and especially where planting is to be done on a large scale, an agent of the Division will visit the locality and inspect the conditions on the ground. Having become familiar through a personal examination with the situation, soil, exposure and other factors, he is prepared to make definite and comprehensive recommendations. These may sometimes be given verbally, but will usually be embodied in a planting plan. The

planting plan includes a statement of the species best adapted for the desired purpose in the given locality, directions in regard to the starting and care of the seedling trees in the nursery, the preparation of the soil, transplanting and setting out, the proper spacing of the trees and the subsequent care necessary to be given them. When advisable a diagram or sketch plan illustrative of the arrangement or spacing of the trees accompanies the report.

The services of the agent of the Division of Forestry are without cost to the applicant, but his expenses for traveling from Honolulu to the locality visited and return, and his subsistence must be borne by the applicant. When several persons on a single island are visited on one trip, the cost of the trip will be divided among them.

As one of the objects of the Division of Forestry in co-operating with the individual planter is to secure the general introduction of better methods, the Division reserves the right to publish and distribute the plan and its results for the information of the public.

Applications will so far as possible be considered in the order in which they are received, but precedence may be given to those likely to furnish the most useful examples.

The form of co-operative agreement to be entered into by the individual planter and the Division of Forestry is given below. The agreement is not a formidable legal instrument; it is merely a statement of the conditions upon which the planting plan is prepared, and is only drawn up to prevent misunderstandings. It may be cancelled by either party upon ten days' notice:

TREE PLANTING AGREEMENT.

Honolulu, Hawaii,

....., 190..

The Division of Forestry of the Board of Agriculture and Forestry of the Territory of Hawaii and..... of, Island of, Territory of Hawaii, mutually agree as follows:

1. The Division of Forestry, in order to spread a knowledge of practical forestry in the Territory and to encourage tree planting therein, through the introduction and wider application of improved ways of planting and caring for forest plantations, wood lots and wind-breaks,

agrees to prepare a planting plan for.....acres of the land of the said
....., situated and described as follows:

2. The owner agrees to pay the traveling and subsistence expenses of the agent of the Division of Forestry, while engaged in the field work incident to the preparation and carrying out of the said planting plan.

3. The owner does not agree to put the said plan into operation until it has been accepted by him.

4. The owner agrees to keep such records of the work done under the said plan as may be recommended therein, and he further agrees that the Division of Forestry may publish, for the objects named in the first paragraph of this agreement, the information gained while preparing the plan or taken from the record made by the owner.

5. After the completion of the said planting plan and its acceptance by the owner, the Division of Forestry will, upon a written request, undertake to supervise the execution thereof, so far as may be necessary, at a cost to the said owner to be definitely agreed upon before such supervision is undertaken.

6. This agreement may be dissolved by either party upon ten days' notice given to the other in writing.

(Signed)
Owner.

(Signed)
Superintendent of Forestry.

HOW TO MAKE APPLICATION.

Applications for the assistance offered in this circular must be made in writing to the Superintendent of Forestry, P. O. Box 331, Honolulu. They should specify the exact location, the acreage to be planted, the object for which the planting is done, and the time when it is desired to begin planting.

Correspondence in regard to the purchase of seed and plants should be addressed to Mr. David Haughs, Forest Nurseryman, P. O. Box 331, Honolulu.

RALPH S. HOSMER,
Superintendent of Forestry.

APPROVED:

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

L. A. THURSTON, *President.*

Honolulu, Hawaii, December 28, 1905.

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FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Eoa, various species of Eucalyptus, Golden and Pink Shower, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughey, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. ROSMIRE,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 56 pp.
Report of the Commissioner of Agriculture and Forestry for 1902; 28 pp.
First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Hells, Plants, Fruits, Vegetables etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

"On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and E. M. Newell. Circular No. 2; 4 pp., cut; 1905.

DIVISION OF FORESTRY.

"Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 8 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1905.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

"Out of Print.

Any one of all the publications listed above (except those marked *) will be sent to residents of this Territory, free, upon application to Mailing Clerk
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DEAR SIR—I have received policy for \$20,000, issued to me in favor of my daughter, on the continuous installment plan.

My daughter is but eighteen years of age, and this contract guarantees to her \$1,600 at my death, and \$1,000 per annum as long as she lives, and to pay not less than twenty installments even if she should not live twenty years after my death. The reason I am so much pleased with this policy is based upon the fact that I fully realize that no matter how much money I might leave my daughter at my death I would have no guarantee that it would last her through her entire lifetime.

The Company's liability under this form of contract might be \$50,000 or possibly \$20,000, if my daughter should live to be as old as some of her ancestors.

Yours very truly,

ISRAEL W. MARSHALL.

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Vol. III.

MARCH, 1906.

No. 3.

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Agriculturist

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OF THE

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. III.

MARCH, 1906

No. 3

Among the many excellent efforts now being put forth to render the environs of Honolulu more attractive and picturesque, it is to be hoped that due regard will be given to the preservation of our native trees and to their extended cultivation. Few foreign plants are more appropriate to our island scenery than those with which nature has clothed our heights and valleys, yet often preference is given to exotic trees of questionable utility and attractiveness. Whenever the imported species does not possess any superiority over Hawaiian trees it would be well to give the latter priority. The fern-like foliage and rapid growth of the Algaroba have long established it in popular favor, and the utility of its wood and beans have brought it into prominence as the tree of greatest economic importance in Honolulu. The sturdy ironwood is another introduction which has won a permanent home here, although its foliage and appearance recall a less congenial clime. The poinciana, too, despite its unsightly and untidy aspect during most of the year, redeems itself by its wonderful florescence, and although unsuited for growing alone will always find a use when associated with other trees. The casuarina, and many flowering trees and shrubs, and imported palms have alike proved their fitness for extensive use. Yet none of these conforms with the beauty of our island more fitly than the delicate colored foliage of the kukui, the cool inviting shade of the kamani, the picturesque beauty of the hala, or the fan-like leaves of the graceful loulu palm.

These and many others of our native flora are worthy of more extensive cultivation in private and public lands. The preservation of such specimens as remain in Honolulu and its vicinity also deserves attention. On the Pali road are many hala trees struggling for existence beneath the heavy weight of an imported evil smelling vine which encumbers them. It would surely be a worthy act to relieve them of their unsightly load and thus add to the picturesqueness of the valley the beauty of one of our most interesting and characteristic trees.

Much lack of foresight is often observable in the unmethodical selection of trees for planting on small lots. Very often this was done in former years without regard to the future development or suitability of the kinds chosen, and the occupant apparently strove only to plant as many seedlings as could be accommodated in the space at his disposal. The result has been that many yards are now covered with a veritable jungle, in which no tree has been able to attain a generous growth, but all have struggled for a precarious existence. In commencing the work of local improvement, the first advance has often been made in thinning out the trees and plants upon vacant land and public gardens, and much benefit has resulted by this procedure. It is, however, of great importance that before the axe is set indiscriminately at work, the opinion of some one experienced in tree lore or possessing a general knowledge of botany should be consulted. During the past month we have seen a stately and valuable araucaria felled by private enterprise in order to accommodate an inferior mango tree, and many other acts have lately taken place, which could never have been tolerated by a lover of nature. In this way Honolulu has been despoiled of some of the rarest and most beautiful examples of its flora, which it will require many years to replace.

The application of scientific knowledge and modern improvements to the cultivation of the soil have during the last few years achieved such important results for agriculture that no farmer can now be sure of success without a special training in branches of learning which formerly were considered of academic or speculative importance. The diversity and amount of knowledge now requisite in the husbandman is far greater than can be acquired in a training solely confined to farm life. In order to equip himself for successful competition with his fellows it is now necessary for the aspiring farmer to attend a course of instruction at an agricultural institution where he may benefit by the accumulated experience of the agriculturist and the learning of the scientific investigator. Technical colleges have long proved their utility in furnishing competent workers to the varied branches of

industry, and the exigencies of modern life are now calling into existence a system of institutions which is producing a race of educated farmers. It is to be expected that Hawaii will before long possess a thoroughly equipped agricultural college akin to those already established and which are proving themselves of such utility on the mainland.

In this country little economic use is made of the Prickly pear. The diffusion of this remarkable plant to various parts of the world is chiefly due to the Portuguese who have introduced it extensively to India and Mediterranean countries. In the former country on account of its wonderful rapidity of growth and vitality it has taken possession of immense tracts of land and become difficult to eradicate. In Southern Europe its refreshing, though somewhat insipid fruit, has been found to respond well to cultivation, and three well marked varieties have been produced, the red, the white and the yellow. The cultivated fruit is of increased size and is much esteemed. The plant thrives best on well drained lime soils and is greatly improved by fertilization.

Following the public hearings held on March 7th, to consider the setting apart of certain areas on Oahu and Kauai as Forest Reserves, Acting Governor A. L. C. Atkinson on March 9th, 1906, signed the two proclamations appearing elsewhere in this issue, creating respectively the Ewa and the Kealia Forest Reserves. Both of these new reserves are important additions to the chain of Hawaiian forest reserves, because each covers a watershed on which much valuable land is dependent for its water supply. The total area of the Ewa Forest Reserve is 28,550 acres, more or less, of which 4,759 acres are actually set apart. The area of the Kealia Forest Reserve is 9,935 acres. In this case 7,385 acres are set apart. The reasons underlying the creation of both these reserves were set forth at length in the reports of the Superintendent of Forestry published in full in the *Forester* for February, 1906.

LIMU.

A publication recently issued from the University of California and written by William Setchell under the above title, deserves attention. The writer is indebted to his informant on the subject of a short visit to the Hawaiian Islands in the summer of 1900, during which he collected his data on the shores in the neighborhood of Honolulu and Hilo.

The "Limu" of the Hawaiian Islands is a term applied to edible seaweed, restricted chiefly to Algae and certain lichens. The term is also extended by the natives to include a few Ascidi-ans, Corals and other motionless animals. The names and uses of the different varieties of limu are numerous, but it is difficult to obtain them from the present generation.

Limu is eaten by the native Hawaiians generally in its un-cooked condition, and at low tide it is a common sight to see the women gathering it wherever the coast is favorable to its growth. In the Hawaii Almanac and Annual for 1886 the Rev. C. M. Hyde, speaking of ferns, says: "To genuine Hawaiians a feast is not a regular luau, as foreigners call such festivals, without the presence of these dryads of the mountains, and as lovingly do they rejoice also in bringing to the feasts those nymphs of the sea, the limu (sea mosses), some of which, like the *lipoa*, have become to the Hawaiian the synonym of the most delicious fragrance."

The Hawaiians are very particular in their selection of limu and especially esteem those obtained from certain localities. The foreigner, as a rule, hesitates to attempt the new food,, but when he overcomes his prejudice he is often rewarded with flavors that repay his temerity. The paper in question, concludes with a description of various kinds of limu, arranged in alphabetical order. Whenever possible derivations are given and notes on the particular use of the variety referred to.

As with most Hawaiian lore, reliable information on the native use and nonenclature of this comestible is to be obtained from the older generation of natives who are rapidly passing away. A familiarity with the Hawaiian language is requisite to a proper elucidation of such subjects, as the information sought is as a rule possessed only by those who have little understanding of English and who are generally reluctant to impart it to strangers.

THE HAWAIIAN ENTOMOLOGICAL SOCIETY.

The Hawaiian Entomological Society was instituted in December, 1904, a preliminary meeting, presided over by Mr. Kotinsky, being held in the Board Room of the Bureau of Agriculture and Forestry, on the 15th of that month to consider the advisability of forming such an organization. At this meeting Mr. Kirkaldy was elected temporary secretary and Messrs. Craw, Kotinsky and Terry were appointed to draw up a constitution for the new society. On January 26th, 1905, the first regular meeting was held and a constitution adopted, which has already appeared in the Hawaiian Forester. Since that date regular meetings have been held and the association, which at the first preliminary meeting consisted of eight, now boasts twenty members, among whom are included nearly all the entomologists of the Territory.

The *raison d'être* of the society as stated in the constitution, is to promote the study of entomology in all possible bearings and to encourage friendly relations between those in any way interested in the science. From a perusal of the first number of the Proceedings of the Society for 1905, which has just been issued, it will be seen that these objects have been very satisfactorily fulfilled, and the meetings have elicited many interesting and valuable papers which have contributed materially to our knowledge of the insect fauna of our own and other lands. Among the most important articles which have been read during the year are to be included:

Notes on a Trip to Australia (Perkins).

Notes on Australian Butterflies (Perkins).

The History of Economic Entomology in Hawaii (Kotinsky).

Notes on a Trip to Hawaii (Swezey).

Insects Taken by Mr. Wilder at Midway Island (Perkins).

Literature of Hawaiian Entomology for 1905 (Kirkaldy).

Mouthparts of Sawflies (Van Dine).

A Method of Setting Insects (Perkins).

Food Habits of Hawaiian Birds (Perkins).

Mr. Van Dine's article contains two excellent plates drawn by the author.

Among much which is technical in the "Proceedings" are to be found information of great interest to the uninitiated reader.

The following is a brief summary of Mr. R. C. L. Perkins' paper on the Food Habits of the Native Hawaiian Birds.

"The Hawaiian Birds are classified according to their food habits as follows:

- (1) Honey or nectar suckers: useful because pollinizers.
- (2) Beneficial fruit eaters which spread the seed without injuring them, and propagate the native plants.
- (3) Harmful fruit-eating birds, which destroy seeds they eat.
- (4) Eaters of injurious insects: beneficial.
- (5) Eaters of useful insects are practically unrepresented.

In the family *Drepanididae* there are 34 species on the Hawaiian Islands, 12 of them feed on nectar regularly; 2 are doubtful honey-eaters; 7 rarely eat honey, yet were seen eating it; they have honey-sucking tongues and are apparently leaving off the honey-sucking habit and are taking to insect eating; 30 species eat noxious insects, certainly all of them feed their young on insects; most of these eat spiders which may be either beneficial or otherwise; 3 are beneficial fruit eaters; 3 are highly injurious fruit or seed-eaters, yet these also eat caterpillars and feed them to their young, and are thus far beneficial; 2 species are indifferent.

Of the four Oo, two are chiefly honey-suckers, but also eat insects and one is chiefly an insect eater; one is extinct. Most of these birds are now too rare to be of any practical value.

Of the five thrushes, which are very fine songsters, four are large fruit-eaters, but also devour insects; the fifth is an insect-eater confined to Kauai. There are three species of fly-catchers, all entirely insectivorous and very beneficial.

In a discussion on the use of insects as human food at the March meeting of 1905, Dr. Cobb stated that at one time a committee was appointed in Nebraska to experiment with grasshoppers for food. Although these insects were reported to be palatable, their general introduction as an article of diet seems to have failed. Mr. Terry reported that he had tested "Kungu" cake, which is made from a species of insect in the lake district of Central Africa and eaten by the natives there, and said that the flavor and texture suggested oatmeal.

Meetings of the Hawaiian Entomological Society are held

monthly in the Board Room of the Bureau of Agriculture and Forestry. Correspondence should be addressed to the Secretary-Treasurer, Jacob Kotinsky, Bureau of Forestry, King Street, Honolulu, from whom copies of the Proceedings may be purchased. At present the Society has no separate library and does not exchange its publications.

The following is the list of officers of the Society for 1906:

President R. C. L. Perkins

Vice-President G. W. Kirkaldy

Secretary-Treasurer Jacob Kotinsky

Members of Executive Committee

..... Otto H. Sweezey, D. L. Van Dine

Editors of the Proceedings

..... G. W. Kirkaldy and Otto H. Sweezey

SUPPORT FOR FIELD TOMATOES.

The staking of field tomatoes is now generally practiced by large growers of this popular vegetable and is claimed to well repay the expense on account of the increased earliness of the crop and its improved qualities. The method of staking partakes of the nature of a trellis, the end posts of which should be about five or six feet long. Provided the ground is not too uneven the trellis may be made of almost any length. At intervals of about twenty feet, strong stakes should be placed between the end post, and along the top of these, beginning from the end, a heavy wire should be fastened, and another parallel with it at about ten inches from the ground. It is essential to have the wires absolutely taut and to effect this a wire-stretcher should be used and the posts anchored by guy wires. A good, stout twine should then be strung transversely between the two lines of wire by means of a hitch in such a way as to prevent slipping. Upon these the vines are trained. If kept well trimmed from the beginning, the plants will soon attain a fine growth and bear abundantly.

THE BERKSHIRE PIG.

(Reprinted by permission from the Journal of the Department of Agriculture of Western Australia.)

The Berkshires are among the oldest, best known, and most popular of the improved breeds of swine. Their great adaptability to a variety of conditions, together with their early maturing qualities, and their ability to stand up under heavy weight, has earned for the improved Berkshire a place well up toward the head of the list as a general purpose or farmers' pig. To the many admirers of the trim animals of this breed which are to be seen in abundance at every leading show, something of the history of their development should be of interest. However, like many of the older breeds of stock of undoubtedly "blue blood," it is somewhat difficult to give their genealogy with accuracy.

As the very name implies, the breed is of English origin, and first attained a position of prominence in the County of Berk, or Berkshire, England. However, these original Berkshires were very different from their descendants of today, and it is considered doubtful if the breed attained to any considerable degree of perfection in its home county, the prevailing opinion being that the earliest marked improvement of the breed was made by the breeders of some of the other counties of southern and central England.

These original Berkshire pigs are generally described by all authorities as large, raw-boned, coarse pigs, with pendant ears, and of a colour ranging from a tawny white to a sandy red or black and variously spotted. It is thought by some that these early Berkshires were from the same ancestry as the Tamworth, and from the descriptions given it would seem that they more nearly approached that breed in type than they did the Berkshires of the present day.

Indefinite as it this description of the foundation stock from which this useful breed has been evolved, the means by which this improvement was brought about seems to be equally uncertain. Some writers tell us that the Chinese, Siamese, and Neapolitan crosses were used, while others draw the line at the Neapolitan cross, contending that the improvement was brought about entirely by crossing with the Chinese pigs, and still others affirm with equal certainty that the principal improvement was due to

the use of Italian and Spanish crosses during the latter part of the eighteenth century.

Among the first mentioned of the early improvers of the breed are Richard Astley and Lord Barrington. Lord Barrington did his best work as a breeder between 1820 and 1830, and it is asserted by some authorities that to him the chief improvement of the early Berkshire was due, and that most of the old English herds of quality traced their ancestry to this herd. However, a number of other prominent English breeders of later date are mentioned as contributing largely to the improvement of the Berkshires.

Early importations of the breed were made to America, several being recorded as occurring between 1820 and 1835. However, it was not until nearly half a century after the first importations that the breed attained to general favour in that country. In 1875, the first, or American Berkshire Association, was organized, and in 1893 the National Berkshire Record Association was formed. Since that time the improvement of the Berkshire has gone on as rapidly, if not more so, in America as in England. This widespread interest, however, caused a natural rivalry between breeders in those two countries, and in some sections the somewhat larger and coarser English type is the favorite. As was natural, several types of this breed sprung up during the early improvement, but a good degree of uniformity was finally established, and while there are still coarse and fine types of this breed, they are all possessed of the same general characteristics which have made the breed popular with the American farmer.

The Berkshires are among the largest of the medium breeds. They are adaptable to a wide range of conditions, probably heading the list of the improved breeds in this respect. They possess great muscular power, and more than ordinary activity. They possess the quality of early maturity to an extent which enables the breeder to fatten them at almost any age desired, yet when properly fed for a longer term they will attain to great weight and size. They have limbs with bone of good quality, which, together with their activity, makes them exceptionally good grazers. They are hearty feeders, and as a breed have a strong digestive and assimilative power, which enables them to give a maximum return for the food consumed, although they are of a rather nervous and excitable temperament, and need careful and quiet handling the best results. They are possessed of strong pre-

potency, and on this account are of great value for crossing upon the coarser breeds. They are medium to good breeders, and their meat is of good quality, being generally firm and well marbled. A summing up of these qualities marks the Berkshire as an excellent pig for the improvement of common or coarse stock and a dividend-payer for the farmer who keeps a few pigs and feeds and cares for them well. That many farmers have found him such is evidenced by the wide distribution of the breed over the United States, Canada and Australia.

Where this care and feed is insufficient, as is the case upon too many farms, there is some doubt about the superiority of so highly organized, nervously active a breed, and there is probably a wide difference in the appearance of a Berkshire in condition and a scrub of the breed than between similar types of almost any other of the improved breed of pigs.

It is unnecessary to enter into a detailed description of the beautiful, glossy, black, finely marked Berks, with which every farmer is familiar who has noted them at our agricultural shows. Their broad, straight backs, well sprung ribs, deep fleshed loins, and heavy quarters, appeal to every lover of tender, juicy pork, while the general appearance of a good-conditioned and well groomed Berkshire is such as will leave a lasting impression upon the interested spectator.

RABBITS IN NEW SOUTH WALES.

The Government of New South Wales has spent over \$4,000,000 for all kinds of means to prevent the growth of the rabbit plague, and it has now been decided to fence in the whole country with an immense wire net.

The expense of this wire net is estimated to exceed \$5,000,000, and it is thought that the wire required for this purpose can be imported from abroad at the cost of about \$150 per mile, delivered at Sydney.

The rabbit plague is increasing from year to year, which is best shown by the fact that such an enormous amount as \$5,000,000, or nearly 10 per cent. of the annual revenue of the country, is to be spent for this purpose.

CITRUS FRUITS IN HAWAII.

Under the above title, Mr. J. E. Higgins, Horticulturist, Hawaii Agricultural Experiment Station, contributes a valuable article to our local literature. The introductory paragraphs of the bulletin are here given:

"Citrus fruits were introduced into Hawaii more than a century ago. In the record of Vancouver's voyages it is recorded that in the year 1792 that explorer gave to one of the Hawaiian chiefs in Kona "some vine and orange plants," besides other valuable plants and seeds. A few days later "some orange and lemon plants that were in a flourishing state," were landed on the Island of Niihau. These oranges were probably from Tahitian seed, since Vancouver sailed from Tahiti to these islands and records having received large supplies from the natives before his departure. Even earlier attempts at the introduction of the orange and the lime are reported, but it is difficult to say which of the efforts was first successful. Some of the oldest orange trees in the islands are said to have been in a flourishing condition a few years ago at the residence of the late Thomas Brown, Esq., on Kauai.

Oranges, lemons, limes and pomelos have all found a congenial home in Hawaii. Indeed, the orange is sometimes thought of by the casual observer as being indigenous, so eminently suitable have the soil and climate proved to be.

When properly cared for and fertilized some of the native orange trees produce fruits unexcelled in point of flavor and juiciness, bearing little resemblance to the very indifferent specimens often found in the markets, which have been picked green, dumped into casks without curing, and sent into the market.

These facts are in striking contrast with the statistics, showing that between \$50,000 and \$60,000 worth of citrus fruits were imported into Honolulu alone in the year ended January 27, 1905. Considerable quantities have also arrived at the ports of Hilo and Mahukona direct from San Francisco. These circumstances have seemed to make it desirable to give a statement of common practices in citrus culture, with special reference to their application to Hawaiian conditions."

A comprehensive description of the cultivation of the orange then follows, special attention being given to budding and graft-

ing, layering, planting, tillage, irrigation, fertilization and pruning. A practical description of gathering, packing and marketing the fruit is also given, together with accounts of insects and other diseases and their approved remedies. After treating of the orange, the lemon, "Pomelos, Grapefruits and Shaddocks" and the lime are accorded due notice. The article comprises Bulletin No. 9 of the local experiment station, is illustrated, and should be read by all who grow citrus fruits in Hawaii.

LIZARDS.

To show how the lizard may be a friend to the apiarist, I will describe a few instances. For two or three months last summer there was a lizard which came into the house regularly between noon and 1 o'clock to catch flies and ants from the floor. There was a very industrious nest of ants located about 30 feet from the house, which formed a black line of foragers to the porch, and went up one of the porch posts and down a wire into our wire-screened safe for fruit. I put tar on the wire, and then they marched in across the kitchen floor to a can of honey that was there for use on the table. Whenever honey was drawn into a dish a little would stick to the cap, and thus attract the ants. I noticed that when the lizard caught a fly, it always turned and picked up from two to four ants, so I made him welcome. At the end of five or six weeks the ants seemed to be entirely cleaned out.

At another time an open five-gallon can of granulated honey was set on the stove to melt. A coarse cloth was thrown over it to keep robber bees out. The honey boiled up suddenly on one side and oozed through the meshes of the cloth. As I was at the dinner-table at the time, the honey was set off the stove on the floor a few feet from my chair, and about a dozen flies and five or six robber bees pounced upon the oozed honey at once. The lizard came in as usual, and immediately hopped upon the cloth among the bees and flies, and, after catching a dozen flies and not molesting a single bee, it climbed down as quietly as it came in and disappeared out the door.

Although these lizards eat house-flies and ants, yet they prefer the large flies, spiders, cockroaches, crickets, moths, canker and cut worms, and grasshoppers, all of which I have often seen them catch.—Writer in *Gleanings*.

REPORT OF THE SUPERINTENDENT OF ENTOMOLOGY.

March 7, 1906.

Board of Commissioners of
Agriculture and Forestry
of Hawaii.

Gentlemen:—Since my report to you, dated February 7th, I have the following additional agricultural, horticultural quarantine work made by Mr. Austin and me. During the above stated time we have visited thirty (30) steamships and sailing vessels entering this port from outside the Territory, on which we have found seventeen (17) cases and boxes of trees and plants and two (2) bales of trees and six thousand six hundred and ninety-two (6692) packages of fruits and vegetables, principally from the coast. Forty-three packages of plants and seeds by mail. The tree imports consisted of orange, lemon, grape-fruit and lime, on which we found a few larvae of "black scale" (*Saissetia oleae*) and "cottony cushion scale" (*Icerya purchasi*). The trees were thoroughly fumigated with hydrocyanic acid gas. In deciduous trees was one large case of peach and plum trees from Florida, two trees were attacked by the Eastern "peach root borer," *Aegeria citiosa*, which we dug out and have in the office as exhibits. One bundle of five plum trees were found to be affected with a fungus disease attacking the twigs, which were confiscated. In fruit we returned six cases of grape fruit infested with *Lepidosaphes beckii*; we destroyed by burning ten boxes of apples badly attacked by "apple scab fungus" (*Fusicladium dentriticum*). One basket of oranges from Pago Pago was not permitted to come ashore. One rose bush by mail was badly affected with a fungus disease. The owner was notified, after viewing it she consented to its destruction by burning. Three (3) large cases, one thousand (1000) plants of New Zealand flax plants (*Phormium tenax*) were imported and each individual plant carefully examined and then fumigated with hydrocyanic acid gas, the cases and packing were also fumigated; we did not find any insects or disease. This is a fiber plant and quantities of the fiber in bales is brought on each steamer from New Zealand entering San Francisco. Mr. Byron O. Clark of Wahiawa, intends testing it to see if it cannot be profitably grown on these

Islands. As it requires more moisture and better land than sisal I doubt if it will be as profitable as that plant.

Quite an importation of choice California grape vines was made by Mr. Isoshima to be planted at Wahiawa; no insects were found, but in order to be safe we make a practice of fumigating all grape vine stock with carbon-bisulphide, so that vapor was administered to this importation.

Several colonies of lantana destroying insects have been sent out.

Mr. Muir, beneficial insect collector of the Hawaiian Sugar Planters' Association, sent from Fiji a colony of a large "lady-birds" (*Synonche* sp.). They were placed in charge of Mr. Kotinsky, and Miss E. Dayton attends daily to feeding them with aphids, which they greedily devour. They are breeding freely, having passed through the various stages from egg to pupae and as soon as we have native-raised adults will liberate them out of doors.

Mr. Kotinsky and I have twice visited the district where it was reported that a borer was at work destroying the young living branches of the *Algeroba* trees; we made a careful examination but failed to discover any borers. The gentleman showed us where he cut the branch, but we could not find any insect. In a near by wood shed we examined the *algeroba* wood where we found one native borer, species of *Bostrichid*, just entering a stick of wood. This beetle only attacks wood that is beginning to sour after cutting, so I don't look for it ever becoming a pest in growing trees.

On February 27th the S. S. "Nippon Maru" brought a large shipment of grape cuttings for the Federal Experiment Station from the San Joaquin Valley, California, which we took the precaution to fumigate, as they were from a district that is known to be infested with the "grape vine hopper" (*Erythroneura vitis*). This is a very serious pest and breeds rapidly and hibernates in the perfect state so the fumigation would reach any that would have been present on the cuttings.

Mr. Hughes, the Master Car Builder of the Oahu R. R. Co., reported to me the existence of a serious pest attacking the hard wood timbers and finishings of some of their passenger cars. On the 6th inst. Mr. Austin and I visited the car department and found the pest to be Termites, and I prescribed the injection of carbon bisulphide into the infested parts, also gave them the in-

formation regarding the necessity of care in its application keep all lights or fire from the neighborhood of the parts which was fresh.

One of our liner steamers had its cabin wood work attacked in a similar manner, which on my recommendation was treated with the above remedy, that effectually stopped their depredations.

Respectfully submitted,

ALEXANDER CRAW

Supt. of Entomology and Inspection

THE VALUE OF THE GOAT.

Writing on the subject of the common (not the Angora) goat, a correspondent at Nikenbah, Maryborough, says "I am aware that the common goat does not, as a rule, command the sympathy of the general public, but let me show how these animals can be of great use to the settler on scrub lands.

"I felled two pieces of scrub, each of about 20 acres, in 1891 at the same time. The timber on each block was burnt off about six months ago. On one of the cleared portions goats were allowed to roam at will, with the result that to this day there is scarcely a sucker of new growth or a weed to be seen. On the second block, which was protected from the goats, the new timber growth is 3 or 4 feet high, and would cost at least 15s. an acre to bring it to the condition of the other piece, which the goats browsed."—*Queensland Agriculture Journal*

RABBIT DESTRUCTION BY DISEASE.

A systematic investigation is about to be undertaken in New South Wales to investigate the possibility of dealing with the rabbit pest by means of introducing a contagious disease. Funds are already at hand for the purpose and the experiments are to be undertaken by Dr. Danysz. The annual loss to Australia from rabbit depredation is enormous, and attempts at control are only partially successful it is estimated that a distinct gain will be attained as the sums expended every year upon wire netting are a great tax upon the landowner.

It is satisfactory to know that Dr. Danysz gives the positive assurance that his methods will be harmless to the birds and other animal life.

BANANINE FLOUR AND BREAD.

Referring to the West Indies, the *Colonizer* in its issue of January, 1906, states that remarkable strides are being made in systematic attention to agriculture, the culture of tropical products, and the development of new ones; and that this advance is due largely to the initiative and splendid work done by the Imperial Department of Agriculture in those islands, and by the West India Committee in England. The writer of the article goes on to mention one important industry which is entirely of today—"Bananine"—a product of Jamaica.

"Bananine" is a flour product derived from the banana. The natives of Central Africa manufacture a crude flour from this fruit; and speaking of this, the late Sir H. M. Stanley said, that if only its virtues were publicly known, it would be largely consumed, especially by infants, persons of delicate digestion, dyspeptics, and those suffering from temporary derangement of the stomach.

The flour now placed upon the market under the name "Bananine" is far superior in quality to the native-made product, and possesses a higher value as food than even beef, containing, as it does, as high a percentage of proteids, whilst its caloric or energy value is almost four times as great.

"It is from this product," says the *Colonizer*, "that is derived the now well-known 'Bananine' bread—the result of practical and scientific experiments carried over a considerable period—possessing all the qualities of a perfect food, combined with pleasant appearance and flavour. The nutritive properties of 'Bananine' bread are present in the most easily available form of assimilation, and are certainly appreciated by those suffering from dyspepsia and other forms of digestive disorders. It appears as palatable and digestible when freshly baked as when several days old, nor does it become dry even after keeping. It is certainly not a luxury, but an everyday article of food, at a price within the reach of all, and has a pleasant flavour similar to that of the best wholemeal bread."

HONUULA FOREST RESERVE.

Following the usual custom of the Board, there are given below the resolution adopted by the Board of Agriculture and Forestry regarding the proposed Forest Reserve on a part of the government land of Honuaula, North Kona, Hawaii, with the reports of the Superintendent of Forestry and of the Committee on Forestry upon the project.

Acting Governor A. L. C. Atkinson has called a public hearing on April 4th, 1906, to consider the setting apart of this area, and it is expected that soon after that date he will issue a proclamation creating it a forest reserve.

RESOLUTION IN REGARD TO THE PROPOSED HONUULA FOREST RESERVE.

Adopted by the Board of Commissioners of Agriculture and Forestry on March 7, 1906.

Resolved, That all that certain piece of Government land on the Western slope of Mount Hualalai, on the Island of Hawaii, bounded on the south by the land of Puaa 1, on the east and north by the portion of Honuaula now covered by Lease No. 570 of the Territorial Land Office, and on the west by a line drawn from Puu Lae Koa to a point on the Puaa boundary a little below Puu Laalaau, in the District of Kona, Island of Hawaii, as recommended by the Committee on Forestry, on January 9, 1906, based on a report of the Superintendent of Forestry, dated January 8, 1906, as more particularly appears by and on a map and description now on file in the office of this Board, and made a part hereof, be approved as a forest reserve, to be called the Honuaula Forest Reserve.

Resolved, That the Board recommends to the Governor that the said described Government land, within the boundaries of the said proposed Honuaula Forest Reserve be set apart by him, after the hearing required by law, as the Honuaula Forest Reserve.

REPORT OF THE COMMITTEE ON FORESTRY UPON THE PROPOSED HONUULA FOREST RE- SERVE, NORTH KONA, HAWAII.

Honolulu, T. H., Jan. 9, 1906.

Board of Commissioners of
Agriculture and Forestry,
Honolulu, Oahu.

Gentlemen:—Your Committee on Forestry has had under consideration the question of the Territory regaining possession of

the Koa forest on the land of Honuaula, North Kona, Hawaii, and the setting apart of this area as a forest reserve.

On general principles your Committee does not approve of the construction of forest reserve fences out of the funds of the Board, but as this case is one out of the regular order and as the necessity for fencing comes about because of action taken by a former administration, before the organization of the Division of Forestry, a matter over which the Board had no control, we recommend that the action of the Superintendent of Forestry be approved; it being, however, understood that this recommendation is not to be considered as a precedent for future action.

Your Committee approves the recommendation of the Superintendent of Forestry that the forest area on Honuaula be made a forest reserve as soon as the necessary description shall be obtained.

L. A. THURSTON,
Chairman.

W. M. GIFFARD,
ALFRED W. CARTER.

REPORTS OF THE SUPERINTENDENT OF FORESTRY UPON THE PROPOSED HONU'AULA FOREST RESERVE, NORTH KONA, HAWAII.

Honolulu, Oahu, January 8th, 1906.

Committee on Forestry,
Board of Commissioners of
Agriculture and Forestry,
Honolulu, Oahu.

Gentlemen:—I beg to submit herewith a report upon the proposed Honuaula Forest Reserve in North Kona, Hawaii, and to recommend that the Board approve the suggestion made herein.

As the problem of creating this reserve has been a somewhat complicated one, a brief review of the matter may not be out of order. The land of Honuaula lies on the western slope of Mt. Hualalai, in the District of North Kona, Island of Hawaii. It extends from the West Peak of Hualalai to a line approximately parallel to the Government road, about $1\frac{1}{2}$ miles mauka of it. The lower portion of Honuaula was laid out some years ago in homestead lots which have never been opened up. This part of

the land was formerly covered with forest, made up of Ohia Lehua and the various small trees characteristic of the lower elevations. In spots were dense masses of Ie-ie vine. With the running of the homestead lot lines cattle had access to the forest and have since worked back and forth until the forest is now open. Above the homestead tract is a strip of open grazing land, while again above this is a belt of Koa timber of large size and excellent quality. This is the area which it is desired to make a forest reserve. Next to the Bishop Estate land of Keauhou it contains the best stand of large-sized Koa that I have seen anywhere in the Territory; certainly the best on government land. As such it has been my constant endeavor since first seeing it to have it set apart as a forest reserve. Above the belt of Koa, Honuaula runs up in a point to Hualalai, this portion being open grazing land, with a scattering of Mamani trees just above the Koas.

The portion of Honuaula above the homestead lots was formerly under lease to Mr. John A. Maguire. This lease ran till July 10, 1904, but at Mr. Maguire's request it was put up at auction under the two year clause on July 29, 1903, at which time he was out-bid by Messrs. J. G. Henriques and Frank Gomes. Mr. Maguire obtained a six months' extension so that the lease to Messrs. Henriques and Gomes took effect from Jan. 10, 1905. The lease calls for 3044 acres—the annual rental \$610.00. This action took place during Governor Dole's administration.

In February, 1904, Mr. J. W. Pratt, Commissioner of Public Lands, referred the matter to the Board with a request for recommendations. I had visited the land in February, 1904, and after another visit, made in June, 1904, I recommended to the Board that if possible an arrangement should be made through the Commissioner of Public Lands, to cancel the lease, that the land be retained as a forest reserve. The Board approved my report on June 29th, 1904, and so notified Mr. Pratt, who then referred the matter to the Attorney General. But it was ruled by him that the lease could not be cancelled. Accordingly the lease was signed and delivered to Messrs. Henriques and Gomes on Jan. 10, 1905.

At the same time, as I was still anxious to secure the belt of Koa forest as a reserve, Mr. Pratt agreed to make a pro rata reduction in the rental if Messrs. Henriques and Gomes would surrender a portion of Honuaula. To this they assented and accord-

ingly in June, 1905, with Mr. S. M. Kanakanui, of the Survey Office, I visited North Kona to fix on the ground the boundaries of the area to be given up. As a condition of this surrender it was agreed that the Board build and maintain a fence around the area to be given up. This amounted, all told, to about ten miles. Although no formal action was taken by the Board, I discussed the matter with various members and was authorized to go ahead with the arrangement, which I did; contracts being let for the purchase of wire and for building the fence. The wire was delivered and is now stored at the Government Nursery. The area of Koa forest cut out by Mr. Kanakanui, after consultation on the ground with Messrs. Henriques and Gomes, was 1,090 acres. After the lines had been run Messrs. Henriques and Gomes refused to agree to the terms of reduction offered by Mr. Pratt, standing out for certain propositions which could not be considered. The fencing contract was accordingly cancelled, a provision for doing so, in case of need, having been included therein.

In the meantime Mr. Pratt had announced his intention of leasing the lower part of Honuaula, including the old homestead tract. This opened a chance for further negotiations on which I have been working at intervals during the last six months. In December, 1905, Messrs. Henriques and Gomes came forward with a modification of the original proposition of a pro rata reduction, whereby some 1,300 acres, containing the best part of the Koa forest and also the triangular area of open land running up to the peak of Hualalai were to be surrendered by them, provided the Board agreed to fence the line separating the reserve from the part of Honuaula retained by them, a matter of about two miles. Mr. Pratt agreed to this proposition so far as the reduction of rental was concerned, and as the cost of fencing the two miles was so very much less than I had been authorized to incur in the summer, especially as the wire was already in hand, I agreed for the Board.

Messrs. Henriques and Gomes had an alternative proposition that the Board buy out their lease-hold, but this proposition was not one which could be considered. It need not be discussed here.

Of the 1,300 acres surrendered by Messrs. Henriques and Gomes a portion, the exact area of which I do not now know—perhaps a third of the whole—is the open land above the Koa belt before referred to. I have arranged with Mr. Pratt to lease

this upper section with the provision that a fence be built along the top of the Koa forest. This area separates two lands controlled by Mr. Maguire, and is of value to him as a connecting link. Mr. Maguire has expressed his willingness to be a bidder for the land on the terms named. This takes care of fencing three sides of the reserve. On the fourth, the south side, it adjoins Puaa 1, a narrow strip now belonging to the Bishop Estate. I am in communication with Mr. Dodge and Mr. Maguire, who owns the land beyond, in regard to the matter and think that it can be arranged by utilizing existing fences, to enclose this side at a very small cost.

While I do not approve of the policy of this Board agreeing to build and maintain the fences around the forest reserves, I do believe that this case is a justifiable exception. As has been pointed out Honuaula is a legacy from a former administration, which came to the Board outside of the regular channels. After several attempts and much labor a workable solution has been arrived at. By the construction of about two miles of fence—the wire for which is already in hand—there can be secured as a reserve an area of valuable forest containing what is, so far as I know, the best stand of large sized Koa on any government land in the Territory; almost as large an area, in fact, as was to have been secured by the ten miles of fencing authorized last summer.

Therefore in view of the benefit to the district from the continuance of a forest belt on the mountain, of the danger which results when a forest like that on Honuaula is subjected to grazing, and especially because of the increasing market value of Koa and the development of Koa lumbering on Hawaii,—which will, I trust, in time lead to the proper utilization of this forest,—I recommend that the Board approve the action taken by me and further that it recommend to the Governor the reservation of the area as a forest reserve.

The technical description of the area will be submitted in a supplementary report, one or two points in the new boundary having yet to be fixed. This will be done within a short time by Mr. F. E. Harvey of the Survey Office, who expects to visit Kona for this and other work on January 19, 1906.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

Honolulu, Oahu, March 7, 1906.

To the Board of Commissioners of
Agriculture and Forestry,
Honolulu.

Gentlemen:—On January 9th, 1906, the Committee on Forestry, reported favorably upon a report of mine, dated January 8th, 1906, having to do with the reservation of a portion of the land of Honuaula, North Kona, Hawaii, as the Honuaula Forest Reserve. Action by the Board on this proposed reserve was, however, postponed until a description of the area to be reserved should be prepared.

I have the honor to submit herewith a technical description prepared by Mr. F. E. Harvey of the Survey Office, and to recommend that the Board adopt a resolution favoring the reserve, when the matter can be brought to the attention of the Acting Governor to take the regular course. A form of resolution accompanies this letter.

The description is as follows:

Honuaula Forest Reserve, North Kona, Hawaii.

Beginning at the Southeast corner of this reserve, marked by a 3" pipe with a target on Top, marked F. R. T. H., and large ahu, on the boundary of Puua 1 and Honuaula, true azimuth and distance from Government Trig. Station, Puu Laalaa, being $61^{\circ} 32' 17''$ distance 960.3 feet as shown on Government Survey Registered Map No. 1972, and running by true azimuths:

1. $61^{\circ} 32' 17''$ 4319.7 feet along land Puua 1, to a 3" pipe and target marked F. R. T. H.:
2. $137^{\circ} 22' 15''$ 6871.9 feet along makai portion of Honuaula to a 3" pipe and target marked F. R. T. H.;
3. $223^{\circ} 00' 00''$ 3549.0 feet along remainder of Honuaula to + on stone, pipe with target marked F. R. T. H. and large ahu;
4. $312^{\circ} 50' 30''$ 8225.4 feet across mauka portion of Honuaula to the initial point.

Area 665.0 Acres.

FRED E. HARVEY,
Assistant Government Surveyor.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

BY AUTHORITY.

PROCLAMATION OF FOREST RESERVE IN THE EWA, WAIANAЕ AND WAIALUA DISTRICTS, ISLAND OF OAHU.

UNDER and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of the Territory of Hawaii, enacted April 25, 1903, and amended by Act 65 of the Session Laws of the Legislature of 1905, and of every other power me hereunto enabling, I, A. L. C. ATKINSON, Acting Governor of the Territory of Hawaii, having duly given the notice and held the hearing as in said Acts provided, do hereby approve as a Forest Reserve the lands in the Ewa Basin, on the Island of Oahu, bounded on the Southwest by approximately the lower edge of the existing forest, on the Northeast by the crest of the Koolau Mountains, on the East by and including the land of Halawa, District of Ewa, and on the West by and including the land of Wahiawa, in the District of Waialua, in the Districts of Ewa, Waianae and Waialua, Island of Oahu, Territory of Hawaii, more particularly described as follows, viz:

Beginning at a point on the present boundary fence between the Ahupuaas of Halawa and Moanalua, which point is distant 10,425 ft. N. 61° 15' E. from the Government Survey Trig. Station "Salt Lake" and from which the Honolulu Plantation Company's Mill Stack bears N. 86° 12' W. Said point is on a rocky peak overlooking the South branch of Halawa Valley and is marked by a "Forest Reserve Monument," Approximate elevation 800 ft.;

Thence N. 50° 02' W. 4754 ft. across South branch of Halawa Stream to flat top knoll between the North and South branches of Halawa Stream which point is marked by a "Forest Reserve Monument" and from which "Salt Lake" Δ bears S. 34° 15' 30" W. and the Honolulu Plantation Company's Mill Stack bears S. 80° 20' 30" W.. Approximate elevation 925 ft.;

Thence N. 59° 58' 30" W. 4177 ft. across the North branch of Halawa Stream to a point on saddle in ridge overlooking Aiea Stream, which point is approximately on the boundary between the Ahupuaas of Aiea and Halawa and is marked by a "Forest Reserve Monument +" and from which "Salt Lake" Δ bears S. 10° 28' W. and the station of the Aiea-Halawa boundary known as "Pooholua" bears N. 55° 01' E. 660 ft., Approximate elevation 900 ft.;

Thence N. 28° 15' W. 2411 ft. across Aiea Stream to a point on knoll 480 ft. from the present Aiea-Kalauao boundary fence, which point is marked by a "Forest Reserve Monument" and from which "Salt Lake" Δ bears S. 3° 26' W. and the Honolulu Plantation Company's Mill Stack bears S. 48° 50' 30" W., Approximate elevation 930 ft.;

Thence N. 41° 14' 30" W. 2075 ft. across Kalauao Stream to a point on knoll on South side of Waimalu Stream, which point is marked by a "Forest Reserve Monument" and from which "Salt Lake" Δ bears S. 2°

37' E. and the Honolulu Plantation Company's Mill Stack bears S. 36° 29' W., Approximate elevation 960 ft.;

Thence N. 50° 48' 30" W. 3737 ft. across Waimalu Stream to a point on ridge on N. side of Waimalu Stream, which point is marked by a "Forest Reserve Monument" and from which "Salt Lake" Δ bears S. 12° 17' E. and from which the Honolulu Plantation Company's Mill Stack bears S. 15° 47' W., Approximate elevation 970 ft.;

Thence N. 41° 14' W. 3651 ft. across Punanani Stream to point on present boundary fence between Ahupuaas of Waiau and Waimalu and which point is marked by a "Forest Reserve Monument" and from which "Salt Lake" Δ bears S. 17° 25' 30" E. and "Diamond Head" Government Trig. Station bears S. 34° 25' E., Approximate elevation 985 ft.;

Thence in a Northeasterly direction, along the Waiau-Waimalu boundary 6195 ft. to the present forest reserve fence;

Thence Northwesterly in an irregular line along the present forest fence across the lands of Waiau, Waimano, Manana, and Waiawa, to the top of hill called Puu Kamanu, which is a boundary point between the lands of Waiawa and Waipio, and is marked by two triangular pits Δ ;

Thence Westerly and Northwesterly along the present forest fence across the land of Waipio to the boundary between Waipio and Waianae Uka at a point from which "Ahunui" boundary mark on Eastern side of Grant 6, is distant 10,380 ft. in a Southwesterly direction along said boundary;

Thence in a Northwesterly direction across Waianae Uka to the concrete post at the East end of the Wahiawa homestead tract as shown on Government Survey Registered Map No. 1941;

Thence crossing the land of Wahiawa by the following bearings and distances as shown on Government Survey Registered Map No. 1942, N. 24° 25' E. 3753 ft. to R. W. Post, N. 22° 26' E. 600 ft. to R. W. Post, N. 69° 44' W. 4860 ft. to R. W. Post, N. 59° 50' W. 1760 ft. to R. W. Post on the South side of Poamoho Gulch;

Thence running along the Ahupuaa of Paalaa, as shown on Government Survey Registered Map No. 1942, N. 82° 20' E. 1603 ft. to rock marked +, N. 81° 5' E. 25,130 ft. to the top of the Koolau Range of Mountains;

Thence Southeasterly along the top of the Koolau Range, being the upper boundary of all the Ahupuaas included with this "Forest Reserve," to the boundary between Halawa and Moanalua;

Thence Southwesterly along the boundary of Halawa and Moanalua to the point of beginning; excepting therefrom such portions of the lands in the valleys as may be below the 650 foot contour lines.

Area 28,550 acres, more or less.

AND I do hereby set apart as a Forest Reserve those portions of the Government lands known as the mauka portion and unleased remainder of the land of Waimano, (above the area described more particularly in Public Lands Office Lease No. 510), and the land of Wahiawa (government), (more particularly described in Public Lands Office Lease No. 530, granting the water rights thereon), within said metes and bounds.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the Territory of Hawaii to be affixed.

(Seal) Done at the Executive Building, in Honolulu, this 9th day of March, A. D. 1906.

A. L. C. ATKINSON,
Acting Governor of Hawaii.

BY AUTHORITY.

PROCLAMATION OF FOREST RESERVE IN THE PUNA DISTRICT. ISLAND OF KAUAI.

UNDER and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of the Territory of Hawaii, enacted April 25, 1903, and amended by Act 65 of the Session Laws of the Legislature of 1905, and of every other power me hereunto enabling, I, A. L. C. ATKINSON, Acting Governor of the Territory of Hawaii, having duly given the notice and held the hearing as in said Acts provided, do hereby approve as a Forest Reserve the lands comprising the mauka part of the North end of the District of Puna, above a line drawn at approximately the lower edge of the existing forest across the lands of Anahola, Kamalomaloo, Kealia and Kapaa, in the District of Puna, Island of Kauai, Territory of Hawaii, more particularly described as follows, viz:

Beginning in the land of Anahola at a + on a stone at a place called Paepae, elevation of 281.0 feet; azimuth and distance to N. B. being 239° 50' 54.5 ft. and running by true azimuths:

1. 3° 14' 36.1.0 feet to place called Panikioi; elevation 348.0 feet;
2. Thence to the North bank of the Anahola river and following the North bank, and up bluff to a place called Kiokala marked by + on a stone, the direct azimuth and distance being 99° 55' 30" 9625.8 feet;
3. 38° 51' 30" 2987.8 feet to a pipe set at the boundary of Anahola and Kamalomaloo at a place called Kamana, elevation 643 feet;
4. 21° 24' 30" 4697.9 feet across land of Kamalomaloo to an iron pipe on boundary of Kealia and Kamalomaloo, elevation 664.0 feet;
5. 25° 41' 3192.6 feet to pipe in summit of Puu Kinui in land of Kealia, elevation 980.0 feet;
6. 350° 34' 2821.7 feet across Mimino Gulch to pipe in Puu Lawii in boundary of Kealia and Kapaa, elevation 852.0 feet;
7. Thence down the slope to foot of ridge and running in a Westerly direction skirting the base of the mountains, crossing Kapahi Stream and up to Moalepe Gulch in vicinity of a place called Pohakiikii, thence up bluff to an iron pipe in the boundary of Kapaa and Waipouli, direct azimuth and distance is 58° 56' 14.487.9 feet; thence following the watershed of the ridge being the boundary of Kapaa and Waipouli, the direct azimuth and distance being:
8. 100° 21' 30" 4031.0 feet to an iron pipe at Kainamanu, elevation 1143.6 feet;

9. $124^{\circ} 12'$ 1724.1 feet to an iron pipe at **Kahilimalani**, the head of the land of Waipouli and the boundary of **Olohena**;

10. Thence up watershed of ridge along land of **Olohena** to head of land of **Olohena** at place called **Pehuaola**, direct azimuth distance being $180^{\circ} 59'$ 5544.9 feet and elevation **3211.0 feet**;

11. Thence following the watershed of the ridge and along the of **Wailua** and **Kalihiwai** to **Makaleha** the Northwest corner of **1** and Southwest corner of **Kealia** direct azimuth and distance being $183^{\circ} 44' 27.7$ feet;

12. $223^{\circ} 57'$ 1969.0 feet along **Kealia** and **Kalihiwai** following ridge to **Tiptop**, elevation **2710.0 feet**;

13. $177^{\circ} 21'$ 1419.0 feet along **Kealia** and **Kalihiwai** following ridge to **Pueo** marked by an iron pipe, the Northwest corner of **Ka** and the Southwest corner of **Anahola**, elevation **2410.0 feet**;

14. $141^{\circ} 20'$ 1537.0 feet along **Anahola** and **Kalihiwai** following ridge to **Last Peak** at an elevation of **2410.0 feet**;

15. $146^{\circ} 42'$ 6526.1 feet along **Anahola** and **Kalihiwai** following ridge to **Kokoiki** marked by a pipe at the Northwest corner of **Anahola**, elevation 2500.0 feet; thence by survey of **Jas. W. Gay** of **Anahola**,

16. $267^{\circ} 20'$ 4092.0 feet to **Peak**;

17. $249^{\circ} 00'$ 726.0 feet to top of **Peak**;

18. $273^{\circ} 00'$ 5214.0 feet to top of **Malamalamaiki Peak**;

19. $245^{\circ} 15'$ 6732.0 feet along ridge;

20. $256^{\circ} 00'$ 1254.0 feet to **Keaooopuu** where old road crosses range;

21. $236^{\circ} 15'$ 4356.0 feet along ridge to bend in ridge;

22. $351^{\circ} 00'$ 1386.0 feet along ridge;

23. $332^{\circ} 30'$ 891.0 feet along ridge to **Puukeakea**;

24. $280^{\circ} 20'$ 2442.0 feet along ridge;

25. $281^{\circ} 00'$ 1452.0 feet along ridge to **Puu Eu**, the highest **Peak**, elevation **1932 feet**;

26. $290^{\circ} 00'$ 4158.0 feet along ridge to **Keaweaumakua**;

27. $292^{\circ} 00'$ 2772.0 feet to a pipe and large ahu on summit of **Kikoo**, elevation **1477.0 feet**;

28. $253^{\circ} 18'$ 3368.0 feet down face of ridge;

29. $351^{\circ} 30'$ 862.0 feet to initial point.

Area 9935.0 Acres.

AND I do hereby set apart as a Forest Reserve those portions of the Government lands known as **Anahola**, **Kamalomaloo** and **Kapaa**, within said metes and bounds.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the Territory of Hawaii to be affixed.

(Seal) Done at the Executive Building, in Honolulu, this 9th day of March, A. D. 1906.

A. L. C. ATKINSON,
Acting Governor of Hawaii.

Board of Agriculture and Forestry.

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The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

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All communications in regard to seed or trees should be addressed to David Hargis, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

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First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

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* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

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JOSEPH W. MARSHALL.

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will

THE HAWAIIAN FORESTER AGRICULTURIST

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APRIL, 1906

No. 4

Few countries are so well provided with the means to investigate and combat the difficulties arising from insect depredations, as Hawaii. No less than three excellent institutions, representing the Federal and Territorial governments and the Sugar Planters respectively, possess laboratories equipped with modern facilities for entomological work, and presided over by properly trained entomological experts. By means of these a vigilant warfare, which is gradually and encouragingly reducing the dangers which threaten the agricultural prosperity of the Islands, is carried on. The chief work of these laboratories and stations has centered around the solution of problems connected with insect ravages of sugar cane and other plantation crops, and has been chiefly observable in field work. Investigations of such practical utility as those to determine the possibilities of establishing the production of silk in Hawaii, have also been undertaken and have been rewarded with success. Of the more tedious laboratory work, entailing much original research and long series of systematic experiment, the general public has known little, but it has contributed generously to the welfare of our Islands by helping to render our plantation crops more immune from destructive insect and other agencies.

Well as this country is provided in this respect, there is still an opportunity for entomological utility in a direction at present not attended to. However adequately the enormous interests involved in the safeguarding of our plantation crops are defended, our gardens are beset by such insect enemies as have not been overcome by efforts mainly directed to larger issues. There is no doubt that without the excellent work of our entomologists in the past, few citrus or other fruit trees in the Islands would be free from insect pest or fungoid blight of some kind. Yet in many cases after the destructive agencies have been in general overcome, colonies of the pest have remained in out of the way situations, from which they have spread as opportunity presented itself. The necessity now arises of eradicating from

small lots these isolated breeding places, which are often responsible for the loss of the entire fruit crop. It is safe to say that there is hardly a house lot of any size in Honolulu which possesses a few fruit trees, some of which have not been rendered useless and unsightly from insect or fungoid pest. Often these colonies are in a more or less dormant condition, or at most, in such a balance that they remain comparatively quiescent during part of the year, to awake to full activity whenever the infested tree attempts to put forth new leaf or blossoms. At these seasons their depredations are sufficient to destroy all development. Many valuable trees are thus rendered unproductive and many unsightly blots are left to mar the appearance of those plants which are sturdy enough to resist attack. In few cases do the colonies appear sufficiently vigorous to spread their destruction to other localities, their development beyond narrow limits being probably due to the success of the methods of check already alluded to.

To a householder possessing infested trees, two alternatives offer. Either he must allow the undesirable condition of affairs to continue indefinitely, thus losing a great portion of his crop and tolerating an unsightly appearance during most of the year, or he must himself actively combat the pest with such means and knowledge as are at his disposal. The local entomologists have done much good and efficient work by disseminating in a readily obtained and untechnical form the knowledge of the most approved methods of dealing with insect pests, but however efficient these may be in the hands of an expert, the average business man has often little opportunity to use, or inclination to invest in apparatus, the working of which he does not understand and which would be so seldom used. To meet this condition of affairs and to place a ready means to destroy these pests at the disposal of all who care to avail themselves of it, it would seem an excellent opportunity for some business house dealing in garden supplies to employ a practical man and to teach him, under the direction of one of the local entomologists, the necessary proficiency in the use of insect sprays and washes. In this way, by payment of a reasonable fee, the operation could be held at the disposal of such lot owners as desired infested areas to be treated, and many valuable trees could be cleaned and rendered productive, and many spots, now unpleasing to the eye, could be rendered beautiful.

ENTOMOLOGICAL NOTES

From the Division of Entomology, Board of Agriculture and Forestry.

BY JACOB KOTINSKY.

A NEW BOOK AND LEATHER PEST, (*Catorama Mexicana* Cher.)

This is a dark brown, chunky little beetle measuring about one-tenth of an inch in length and is covered with very fine silky hair. The grub or larva of this beetle is of about the same length, cream colored, with shiny head and dark mouth parts, quite fussy looking and is usually curled up in its hiding place. From literature at hand it seems that little was known of the destructive habits of this insect. In 1885 Blackburn reports it as "common on Maui, in houses and in decaying trees near sea level." Its very name implies that it comes to us from Mexico. The identity of the species in both the cases cited below has been positively determined by Mr. Perkins. In this Territory the writer has bred it from grubs dug out of books in a glass door case in Kona, Hawaii, which they had invaded. More recently the attention of this office was called to serious damage in expensive leather goods in a store house on Kauai. During a recent visit to this Island the writer had the privilege of ripping open one of the invaded horse collars in this store and found the beetle in various stages feeding upon the straw stuffing. The outward indications of an attack by this beetle are small, perfectly round perforations, some of which are filled with the fine yellowish dust produced by them or are empty and the dust heaps may be found immediately below the object. This dust serves as a guide to detect its presence in books, showing no outward signs of damage. It is safe to conclude from its habits thus far observed that it is a general pest in store houses and book cases and as soon as its presence is detected the measures indicated below should be taken to exterminate it. The habits of the insect will also indicate how it was imported into this country.

REMEDIES.

"An ounce of prevention is better than a pound of cure." The most effective preventives of depredations by this insect is cleanli-

ness. Any portion of the store-house left unswept for a length of time forms a breeding place for pests of this nature. It is good practice to periodically transfer piled stocks of wares from one place to another that has been thoroughly swept and white-washed with a mixture of lime and kerosene. Frequent dusting of books and book cases will disturb these insects and prevent their activity among them. One of the sources for infestation of household or store-house with any pest is the source of supply like grocery stores, drug stores, and other warehouses from which goods are bought. It should, therefore, be the care of the store and housekeeper to examine materials with an eye to detect the presence of injurious pests.

Once a covered book case or store house has been invaded and if repeated cleaning fails to produce the desired result of checking injury by this and smaller pests, we are obliged to resort to drastic measures. One of the most effective checks is fumigation by means of carbon-bisulphide. This substance is an ill smelling liquid, procurable in drug stores, which evaporates in ordinary temperature and, therefore, feels cold to the touch, and the vapors are heavier than air. It should also be borne in mind that *the substance is extremely inflammable and must, therefore, be kept away from fire of any kind.* While it is not instantly fatal to man, it is advisable to inhale as little of it as possible. The vessel which may be either the present container of the objects to be fumigated or specially constructed boxes or chambers in which the fumigation is to be done, should be made as nearly air-tight as possible, particularly so at the bottom. The liquid, which is to be used at the rate of 1 pound to about one thousand cubic feet, is best poured out into shallow vessels which are placed as near the top of the fumigation chamber as possible. The objects to be fumigated being placed below, packed loosely. The chamber should be closed immediately after the liquid is poured out and left closed for at least twenty-four hours. It is then opened and by means of a natural or artificial drafts thoroughly ventilated and invariably the pests are found dead. In case of bad infestation a repetition of this operation may be necessary at the end of a couple of weeks, as the eggs may not be killed by the fumes, and we must depend upon killing the larvae that hatch from them subsequently.

*ROUTINE REPORTS OF THE DIVISION OF
FORESTRY.*

The following three reports were read by the Superintendent of Forestry at the meetings of the Board of Agriculture and Forestry, held on March 7 and 22 and on April 4, 1906:

REPORT OF MARCH 7, 1906.

To the Board of Commissioners of
Agriculture and Forestry,
Honolulu.

Gentlemen:—I have the honor to submit herewith the report of the Division of Forestry for the period from February 7th to date, the last meeting of the Board having been held on February 7th.

FOREST RESERVE.

Owing to the illness of Governor Carter the public hearings in regard to the Kealia and Ewa Forest Reserves were not called until March 7th. The description of the boundaries of the proposed Hanuaula Forest Reserve, North Kona, Hawaii, was received from the Surveyor on Feb. 21st and forms the subject of another letter to the Board, under the date of today.

On Feb. 23 I went over to the District of Hana, Island of Maui, to look into the forest situation there and to fix a forest line across the district; the latter work in response to a request from the Commissioner of Public Lands, made some time ago. I have submitted to the Committee on Forestry a preliminary report upon a proposed forest reserve in Hana, which will later be followed by another report containing a technical description of the boundaries recommended. I returned to Honolulu on March 1st.

ANNUAL REPORT.

The annual report of the Division of Forestry for the year ending Dec. 31, 1905, was submitted to the Chairman of the Committee on Forestry on March 6th. The supplementary reports of the District Foresters are now being copied and within a few days will be ready to go to the printer.

LIST OF SEEDS.

A revised list of the Forest and Ornamental Tree seed for sale at the Government Nursery has been issued as Press Bulletin No. 3, of the Division of Forestry, under the date of Feb. 14th, 1906. This list is now being distributed throughout the Territory.

ADVICE AND ASSISTANCE.

Special attention is called to the report of Mr. Haughs, dated Feb. 27th, 1906, which describes his recent trip to Hawaii, in response to request for advice from persons desiring to establish forest plantations. Planting plans are now being prepared by him to be sent to those who are to do the work. Mr. Haughs returned to Honolulu on Feb. 10th.

Several applications have been received under the terms of Circular No. 1, of the Division of Forestry, and I have been given to understand that others will soon be submitted.

FOREST FIRE NOTES.

In consequence of the forest fire on Tantalus on Feb. 5th, a special fire warning notice was issued by me, as Chief Fire Warden, on Feb. 8th, forbidding the burning of brush, grass, etc., unless the permission of the District Fire Warden has been first obtained, for the period of twelve months from that date.

Mr. W. M. Giffard was appointed Fire Warden on February 7th, and shortly afterward cloth notices giving the special warning were printed and posted on Tantalus. A circular letter has been sent out to each property owner on Tantalus and at the head of Manoa and Pauoa Valleys, calling attention to the special notices and requesting compliance therewith.

On February 13th another fire was reported on Tantalus which called to the scene Mr. Haughs and three laborers, Captain Johnson and some fifteen men, and the Superintendent of Forestry and two of the Commissioners of the Board. The fire proved to be brush, which the Japanese man on Mr. T. Clive Davies' place was burning contrary to Mr. Davies' orders. The fire did not get away and no damage was done, but at noon it looked from town as if a big fire was under way. This led to the despatch of such a large gang of men.

A Forest Ranger (Mr. David Kapihi) has just been appointed for this section of Oahu, whose chief duty will be to look out for and suppress forest fires.

A form of permit for use by the District Fire Wardens during seasons covered by a special warning, has been drawn up and printed. Books containing fifty forms each will be furnished to each Fire Warden for whose District a special notice is issued.

A circular letter has been sent out to each Fire Warden, requesting him to call upon the Chief Fire Warden to issue a special warning at any time when in his judgment the local conditions are such as to require such measures.

On March 4th, Mr. A. M. Nowell, District Forester and Fire Warden for Waialua, notified me that a fire about twenty-five acres in extent had occurred in the section just north of Wahiawa. Fortunately, a plantation luna happened to be at hand with some laborers, and put it out. Otherwise, says Mr. Nowell, it might have spread and become as disastrous as the fire which occurred back of Wahiawa just a year ago.

In accordance with a recommendation from Mr. Nowell, I have issued a special warning notice for a period of six months for the upper part of the District of Waialua. This is published today in the Bulletin.

While on this subject I have the honor to recommend that Mr. John Chalmers of Hana, be appointed District Fire Warden, in and for the District of Hana, Island of Maui, a section that is not now covered.

ROUTINE WORK.

The routine work of the Division has gone on as usual during the past month, as is shown in the reports of the Forest Nurseryman. The new book cases in the library room have been completed, adding much needed shelf room, while a map case in my own office will now permit the proper housing of that collection. The carpenters have also made certain changes and improvements in the Entomological rooms and completed the addition to the stable.

A new style postal collection box has just been installed outside our gate, which will be a convenience.

LIBRARY.

Among the new books recently received may be mentioned the 1905 Yearbook of the Carnegie Institute of Washington, D. C.; publications from the Field Columbian Museum and the U. S. Geological Survey; Vol. IX of the Tenth Census of the United States, containing Sargeant's authoritative "Forest Trees of North America"; publications completing a full set of the technical and other Bulletins of the Bureau of Entomology of the U. S. Department of Agriculture; Kellogg's "American Insects," and the Zoological Record for 1904. Some additional volumes from the old Government Library have recently been turned over to the Board, among which are several valuable publications.

The Library room was used on February 23rd and March 2nd for meetings of the Honolulu Improvement Committee, and on February 8th and March 1st by the Hawaiian Entomological Society.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF MARCH 22, 1906.

Board of Commissioners of
Agriculture and Forestry,
Honolulu, Oahu.

Gentlemen:—I have the honor to submit herewith the regular report of the Division of Forestry for the period from March 8th to date.

During this time, the staff of this Division has been busy in connection with revising for publication the Annual Report for 1905, with the preparation of the proclamations declaring the Ewa and Kealia Forest Reserves and other matters in regard to the proposed Honuauia, Kau and Hana reserves.

On March 20th, I personally examined the upper portion of the land of Waianae-kai, with reference to a proposed forest reserve in that section. This valley, with the adjoining land of Lualualei, will form the subject of a report to be submitted in the near future.

In accordance with the suggestion of the District Fire Warden for Ewa, I issued on March 19th, a special warning notice for-

bidding the burning of brush, etc., in the Ewa Basin, for a period of six months, unless the written permission of the District Fire Warden has been first obtained.

LIBRARY.

Among the accessions to the Library during the last fortnight I would call attention to the first number of two important Journals which we shall now receive regularly, the "Philippine Journal of Science," published by the Bureau of Science of the Government of the Philippine Islands, and the "Quarterly Journal of the Institute of Commercial Research in the Tropics," published by the Liverpool University, Liverpool, England.

The Library room of the Board was used for meetings of the Honolulu Improvement Committee on Friday evening, March 16th, and by the Pawaa Improvement Club on March 15th.

FOREST FIRES.

During the last fortnight forest fires have been reported, as follows:

On Sunday, March 11th, a grass fire of about five acres in extent in the upper Palolo Valley, on this Island, was extinguished by Mr. Haughs and a gang of 17 laborers, before it had a chance to get far enough mauka to do any damage. One of the laborers was taken from the Nursery, five more were picked up locally, and the others were Road Board men sent by Mr. Holloway. The fire was started by children playing with matches in the dry grass back of one of the homesteads. For further details regarding it Mr. Haughs' report should be consulted.

On March 7th, a forest fire was reported by Mr. James Gibb, to be burning on the portion of the land of Paauhau controlled by the Parker Ranch. This fire started from a locality where employees of the Parker Ranch were burning ivy. Brush fires for this purpose had been going on for some time and the work was being done under the supervision of Mr. E. E. Conant. This particular fire resulted through the wind which came up suddenly at the time of the recent Kona and carried sparks into the forest. Large gangs of men from both the ranch and the plantation turned out to fight it and by the next day had the fire under control. During the second night a heavy rain came which extinguished the fire. Mr. Conant in his report estimates

the area burned over at 1000 acres. He states that the damage is nominal as the trees burned were mostly dead timber.

Mr. John A. Scott, District Fire Warden for Hilo, reports brush fires on one of the Ponohawaii homestead lots and also on one of the homestead lots on the land of Kukuau Second, back of Hilo Town both of which were got under control before any damage was done to the forest. These fires occurred on March 7th.

Mr. Scott also reports a grass fire that started on the Waiakea beach lands on March 12th. This fire died out when the wind which was spreading it went down. If the wind had not abated, it is quite likely that it would have run in the same direction as did a fire two years ago, which burned over a section of the lower Waiakea forest.

Two other fires on Hawaii have also been reported, both of which started on the 7th of March. One of these was in the vicinity of Puu Oo, at the upper edge of the Hilo Forest Reserve, back of Hilo Town. Of this fire I have not yet learned the details. The other fire started on Pakua Hill near Hilea, Kau, back of the Naalehu plantation. This fire was reported to me by Messrs. W. G. Irwin & Company, who had received word from Mr. C. Wolters, the manager and District Fire Warden. I have since received a report directly from Mr. Wolters. The plantation turned out a large gang of men which, after a hard fight, extinguished the fire on the afternoon of March 8th. Mr. Wolters says that "it was only by great and repeated efforts that the flames were prevented from escaping into the Ninole and Kaalaiki Hills, from whence they would have spread over the whole mountain side."

I have also been informed by Messrs. W. G. Irwin & Company that a fire had been started by some natives who had been burning brush on one of the Kamae homesteads, back of Hakalau plantation, and was only stopped from getting into the forest by the efforts of a gang of 300 men.

On March 20th, a fire was reported by Mr. G. W. McDougall on the land of Honokua, District of Kona. The Board, being unable to order out men to fight this fire, instructed Mr. McDougall to warn the persons on whose land the fire had been started, that they would be held responsible if the fire escaped and did injury to other lands. I expect to hear further from Mr. McDougall in regard to this fire.

I do not need to call the attention of the Board to the very unsatisfactory condition in which we are placed. With no appropriation to fight forest fires our hands are practically tied, for as conditions now stand there is little which this Board can do to assist in the work. I would suggest, however, that if it is possible to reach, through the Police Department, any of the persons whose carelessness or negligence is responsible for these recent fires, that such a request be made to the Sheriff of Hawaii by the Board.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF APRIL 3, 1906.

Board of Commissioners of
Agriculture and Forestry,
Honolulu.

Gentlemen:—I have the honor to submit herewith the regular report of the Division of Forestry for the period from March 23rd to date.

During this time I personally have been principally occupied in completing for publication the Annual Report of the Division of Forestry for 1905, and in reading proof for the same, with the preparation of reports dealing with the proposed forest reserves in the Districts of Kau, Hawaii, Hana, Maui, and Waianae, Oahu, together with other matters in connection with forest reserve work.

In accordance with the instructions of the Board given me at the last meeting, I have prepared and sent out to each of the District Fire Wardens a circular letter calling their attention to the enforcement of the forest fire law, and to the fact that owing to the lack of a specific appropriation the Board could not be responsible for the payment of any bills incurred in fighting forest fires.

The routine work at the Nursery and in Nuuanu Valley has gone on as usual. This being the seed season for a good many trees a considerable quantity of seed is now being collected.

Important accessions to the Board Library received during this period by the Library are: Bulletin No. 3 of the Massachusetts State Forester's Office, on "Laws Relative to the Taxation of

Forest Lands"; Bulletin No. 36 of the United States Weather Bureau entitled, "First Report on the Relations between Climate and Crop," by Prof. Cleveland Abbe, and Mrs. Sinclair's Illustrated Plants of the Hawaiian Islands.

The Library room of the Board was used on March 22nd for the meeting of the Pawaa Improvement Club; on March 30th by the Honolulu Improvement Committee, or as it is now called, the Honolulu Improvement Advisory Board; and on March 29th and April 2nd by the McCully Improvement Club.

During the period a number of persons have visited the Board building to inspect the woods and fruits and to consult the Library.

I beg to inform you that I propose to leave Honolulu for a trip to the mainland, by the "Mongolia" on the 6th or 7th, and expect to return to Honolulu early in July.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

CAMPHOR IN INDIA AND CEYLON.

"Steps should be taken by the Forest Department to encourage the cultivation of the camphor tree. Since the Japanese have had Formosa the price has gone up at least 50 per cent. There is some attempt at cultivating it in Ceylon, and there must be many places in India and Burma where this valuable tree would thrive." This is a cultivation which will no doubt receive the early and serious consideration of the Ceylon Agricultural Board. There are many reasons why the cultivation of camphor should prove attractive to planters. Camphor at present has to be brought a great distance to Western markets, and the supply is very uncertain. Unscientific treatment of the trees has caused a gradual reduction of their numbers, and a deterioration in quality of the produce. It is at present a monopoly of Japan. The uses for camphor are increasing and as the demand increases, the price will rise. A fair start has already been made in Ceylon with the product.—*Indian Engineering.*

THE MELON-FLY

(*Dacus cucurbitae* Coquillett.)

BY D. L. VAN DINE,

Entomologist, United States Agricultural Experiment Station,
Honolulu.

Last season's crop of melons probably exceeded any previous crop since the advent of the pest of cucurbits known commonly as the "melon-fly." The reason for this is undoubtedly the persistence of the Japanese growers in protecting their melons from the flies at, or immediately after, the setting of the fruit. The low consideration at which these people place their time and effort (when working for themselves), enabled them to take the preventive measures and still receive, what is to them, a satisfying remuneration. In so far as a garden crop of melons, cucumbers, or related products are concerned, the writer believes that a householder can by the necessary precautions produce without prohibitive difficulty, sufficient for his own table. As an agricultural venture on a field basis, it is a question only to be answered by the attempt, taking into consideration the competition of the oriental growers.

This dipterous enemy of cucurbits belongs to the family *Trypetidae* and was described as new to science by Mr. D. W. Coquillett, of the Bureau of Entomology, United States Department of Agriculture, in the spring of 1899, from specimens bred in Honolulu by Mr. Geo. Compere, from larvae living in green cucumbers.

The food-plants are, locally, all the members of the plant family Cucurbitaceae (melons, cucumbers, squashes, pumpkins, etc., including a wild cucurbit, *Sycos* sp.); pods of string beans; tomatoes; and the fly has been reported as infesting ripe fallen mangoes and the fruit of the papaya.

The life-history, covering a period of about three weeks, is as follows: The female by means of her strong ovipositor, pierces the epidermis of the melon, or other fruit, and prepares just beneath in the tissue, an egg-chamber into which through the one incision are deposited from fifteen to twenty eggs. One fly is probably responsible for at least several such clusters.

Observations on the attack of this pest on watermelons indicate that the very young melons are chosen for oviposition since the rind or skin is tender and capable of penetration. Newly laid eggs have been found in melons varying in size from the time of setting of the fruit to three inches in length. The writer has visited infested fields where it has been practically impossible to find a melon within that size, not egg-infested, unless protected in such a manner that the fly could not reach the surface. Larger melons are found newly infested, but the point of incision is, in this case, near the more tender stem end. This is speaking only of watermelons, and undoubtedly mushmelons and cucumbers are capable of becoming infested much later in their growth. In a field where an epidemic of the fly exists the large melons contain the larvae in all stages of development, the melons likewise showing all stages of decay. Since the enemy is an internal feeder, a correct estimate of the damage cannot be gained by a passing observation. Many melons, perfect in shape, are found completely rotted upon being opened, with the exception of the rind. Even in cases where the attack is resisted, the result is a deformed product unfit for the market.

The vines, as well as the fruit, are infested. This is especially true if the growth is succulent. The vines are usually infested in the larger portions near the crown. During wet weather the decay of the fruit and vines progresses more rapidly. In dry weather, the vines, as a rule, survive the attack and the wounded portion heals over. After hatching from the egg, the larvae burrow on into the tissue of the melon, feeding entirely on the interior. When removed from the melon, the larvae have a peculiar mode of locomotion, or possibly protection,—they double themselves together and then, suddenly straightening themselves out, are thrown quite a distance into the air and a distance of several feet from the place they occupied. When fully developed the larvae leave the infested fruit or vines and enter the soil directly beneath where, at a distance of an inch or so from the surface, they pupate.

The remedies have thus far been preventive. The time of planting has no special significance since the fly is in evidence throughout the year and the varied list of food-plants insures a continuous chance for breeding, even though one or more of the crops it infests is discontinued for a season. The short life-cycle provides for several generations during the growth of one

crop. No parasitic enemy or other natural check has been observed.

The common preventive measure among the Japanese growers is to cover the young melons as soon as they set with a piece of gunny-sack, paper or some straw. When the melons have outgrown the protection of this covering they are usually beyond the danger of an attack by the fly. It requires constant attention to cover the newly set melons before they are visited by the over-industrious fly. Protection could be secured by hand-pollinating the flowers and covering them before the fruit is formed. There is a difference in the resistance of the different varieties of melons. The harder skinned varieties are less subject to an attack and it is well to select a hard skinned melon for planting in this country, even at a sacrifice of quality. Frequent cultivation around the plants close up to and among the vines will destroy many of the flies by covering the pupae in the soil to a depth which will not permit them to gain the surface on reaching the adult stage.

All infested melons and vines should be collected regularly throughout the growth of the crop and either burned or buried. Burning is the most effective, but if the acreage is large, holes can be dug at convenient distances throughout the field and a man be directed to go through the field at intervals of not less than five or six days, collect all infested melons and vines, throw them into the nearest hole and cover to a depth of several inches. Abundant irrigation should not be practiced since a succulent growth favors infection, especially to the vines.

After harvesting a crop the partly decayed melons and vines should not be left in the field to act as a breeding place for countless numbers of this pest, as is the custom. The writer has observed abandoned fields swarming with the melon-fly which, deprived of their food in these places, seek the products they infest in the surrounding district.

PIG KEEPING FOR BACON.

Why any occupier of the land should neglect to keep pigs is hard to understand. Food is usually cheap. The pig is also capable of getting its own living for comparatively nothing, and the remainder is reasonably found in potatoes, roots and damaged corn. I think generally too much attention is given to the sow when farrowing, as she is much better left alone. Attention then only excites the mother, causing her to lie on and smother her young. They should have a clean sty, with a moderate supply of short straw or cavins, and be kept with a limited quantity of food and plenty of water before and after for a few days. The losses will then be much smaller than if too much and frequent attention is given. It is surprising how soon the little ones, if given the opportunity, look after themselves in picking a few dry peas and drinking milk or milk and water. This mode of feeding should be adopted, and the owner will then find them make regular improvement, which does not slacken when the weaning season comes on, and a pig regularly and gradually fed commends itself to the feeder and consumer. When the pigs are weaned the mother can be kept sufficiently well for a few pence a day. When bacon is dear is a favorable time to prove the financial result between having a breeding sow and the feeding of several cattle. I am inclined to believe in the pig winning the race. A good and suitable mixture of barley, oats, and peas, ground and used with boiled potatoes or swedes, is much better and cheaper than feeding all meal. If a little milk is at hand, so much the better. Pigs change so often in value that I incline to the regular keeping of a few. They are the best scavengers, and great loss must accrue where there is damaged corn if the pig is absent. Of course, a man with cash in his pocket should generally purchase what he wants, but bought pigs seldom do like those bred on the place, and that have been reared and fed with judgment.—*Journal Agriculture W. A.*

DATE CULTIVATION IN SOUTHERN INDIA.

The Madras Government has discontinued the experiments it has lately conducted in the cultivation of the date. It is reported that the climate of Southern India is too tropical for the growth of this esculent fruit.

ENEMIES OF RICE IN JAPAN.

In an excellent article by P. Chumaturi Nicholas, which appeared in the *Tropical Agriculturist* last year, on "Rice Culture," the following brief excerpts are taken from the portion relating to the enemies of the industry:

Rice Birds. The first invaders are the rice birds (paddy finches and swallows) which husk and devour the seeds sown under "dry-sowing" in expectation of rain, before they spring up. The loss from the above attacks is made good by transplanting. The expedients tried to drive away the birds are primitive, viz., making a noise with dried olas, tins, etc., or shouting. Carrying a gun in one's hand is "considered in Jaffna as almost immoral."

Tortoises and Crabs cause damage by cutting and nipping the young plants. Crabs also may cause great damage by boring holes in the ridges if the cultivator is not vigilant.

Deer and Sambur browse upon the young plants, but are easily frightened away.

Grasshoppers cause much damage.

Caterpillars and Worms are very destructive at times. Of them *Spodoptera mauritia* is the worst pest. Worms and insects in some places are collected daily and burnt.

Paddy Flies (*Leptocoris acuta* and *Hispa oenescens*) attack the fields by myriads and sap the juice at flowering time. A strong wind is the surest extricator of this pest.

Rats and Mice cut and steal the ears. Numbers are killed in their holes during harvesting.

Pigs evade the most careful watch and eat and trample the rice ruthlessly, causing more damage by the latter than the former. The wild pig is daring and wily and dangerous to the watcher.

Elephants are occasional visitors.

Stray Cattle and Buffaloes also occasionally break through fences even when constructed with barbed wire.

Cooly cultivators steal the seed paddy and by other nefarious practices cause loss. On the other hand miserly land owners inflict great hardship on their coolies by withdrawing food and exacting heavy interest.

The process of harvesting is also said to be very wasteful. The corn is stacked for months before being threshed and thus giving an opportunity for attack by insects and animals.

From the above enumerated list of devastators it would seem that rice growing in Hawaii is entirely immune from many of the attacks which threaten the industry in Ceylon.

TREE PLANTING.

In planting trees, too great stress cannot be laid upon seeing that the holes in which they are to be set are thoroughly prepared and fertilized. The plant should be set so that when the soil has settled, its surface will be three or four inches below that of the surrounding ground. If this is done the amount of water and attention required will not be nearly so much as if set in any other position. Not only is careless planting responsible for slow and stunted growth, but the general low vitality of the plant which results, is a direct invitation to insect attack, which will not long go unheeded. Trees and shrubs of vigorous growth are generally able to resist blight and other pests, and the best way to insure this is to exercise care at the time of planting.

MOSQUITOES AND CERTAIN PLANTS.

The recent investigations undertaken to establish the relationship of certain diseases to mosquitoes is rendered more interesting from the fact that to certain plants are attributed the quality of being inimical to the presence of these obnoxious insects. Among the plants attributed with this desirable quality are to be noticed *Ricinis communis*, the "castor oil" plant, and *Helianthus annuus*, the familiar "sunflower." Both of these plants are, apart from this reputed virtue, of such economic importance that they should be planted extensively in all low-lying and marshy neighborhoods, or upon those in which mosquitoes are common. The origin of the belief in the efficiency of the presence of sunflower to prevent malaria and fevers, if its unfavorable influence upon mosquitoes be true, is thus readily understood.

GUAVA FRUIT PULP.

Although the remarkable fecundity and capacity for reproduction of the Guava has earned for this plant an unenviable reputation almost equal to that bestowed upon the less useful *Lantana*, for taking possession of pasture land, yet there is very little doubt that if properly attended to, a very profitable return might be derived from the fruit. In many of the outlying districts of the islands, upon land which has either been abandoned to this plant and those of similar capacity for encroachment, or upon tracts which have heretofore been uncultivated on account of their sterility, enormous quantities of wholesome fruits are allowed to go to waste. This might all be used to profitable advantage if a system of fruit-pulping were introduced similar to that which is employed in many of the agricultural districts of France. The general scope of the method suggested is for the local growers or pickers to preserve the guava pulp in large containers, by an inexpensive and simple plan, and in this form to send it to a central jelly factory for future use.

The pulping is in France usually conducted on a large scale, but it should also be as easily and advantageously carried on with smaller quantities of fruit. The apparatus used consists merely of a copper pan and a metal tank. The fruit to be pulped should, after removal of the rind, be placed in the copper pan and heated to boiling, during which process it should be continually stirred with a wooden spoon. After boiling for a sufficient time it should then be emptied into tin containers which are soldered up. The tins are then removed to the metal tank in which they are immersed in boiling water for about twenty minutes. During this process, if any of the tins are not sufficiently soldered it will be detected, and in this case they must be removed. The quality of the product depends on the degree of cleanliness observed, in the care which is exercised to prevent burning during the process of boiling, in the kind of tins employed and in the manner of soldering. If thoroughly cleansed kerosene tins could be employed, the cost of producing the fruit, to which must be added the freight to a central factory, should not be more than from \$1.75 to \$2.15 per hundred pounds. The best quality of pulp is obtained in France by steam heating

instead of fire directly applied to the pans. This method is desirable in the more delicate kinds of fruit, such as the apricot and peach, but it should not be necessary in the guava if sufficient care is taken. As a rule a small quantity of water, varying with the kind of fruit used and which may be easily determined, is added to the pulp to assist in preventing burning. There seems in this proposed industry to be a splendid field for a man of small capital to establish a central jelly factory in Honolulu and to supply it with fruit pulp from a few pulping plants situated in favorable districts.

PLANTING SEED COCOANUTS.

The following notes on the preparation of seed cocoanuts for planting from the Report of the Philippine Bureau of Agriculture, are worth noting:

"In preparing nuts for planting the best results have been obtained in the following manner. The nuts are selected from trees known to be good bearers, bearing not less than 150 nuts per year, these uniform in size, brown in husk, rich in copra, and fully ripe. Fully 98 per cent. thus selected will germinate successfully. After cutting they should be placed immediately in the nursery provided (of course, in the shade) on the ground—not hung on poles as the native is said to do. Prior to placing in seed beds, a bit of the husk should be chipped off on one side; it should then be laid, cut side up, and left to germinate. Nine months usually elapses before they are ready for planting. The nut when placed on end, as is sometimes done, sends out a spindling plumule easily broken at the point of protuberance and, at best, never gains the vigor of those germinated according to the method given. Two thousand nine hundred and thirty-one trees have been planted this year, most of them on ground that has been plowed and pulverized and put in the same condition as for a corn crop. The result has been a marvellous growth, the trees being more than twice as large as those left to themselves."

ANTS AND FRUIT TREES.

The failure of fruit upon fig, orange and other trees is often apparently due to the presence of ants, which introduce and propagate various pests to the destruction of all new growth. In cases of this kind after thoroughly cleansing the tree either by means of spraying or, if the tree permit it and the attack is not too far advanced, by judicious removal of the affected branches, the pest may be controlled if the ants can be prevented from further invasion. Constant experiment has been made during the past two or three years to exclude ants from certain affected fig trees, but until recently little success was attained in consequence of the untiring persistence of these persevering insects. Many methods were employed, some of which were found destructive to the trees, and others were rendered more or less useless on account of the time and constant attention required. The most satisfactory and probably the simplest device has been found to be a strip of fur or goat skin tied closely around the trunk in such a way that the hair points towards the ground. Various viscid and corrosive preparations have been tried, but these for various reasons have not been satisfactory. Very good results were also obtained by rubbing a band of chalk (which needs constant application), eight or ten inches wide around the tree, across which the ants have difficulty in passing. By the use of either of the methods suggested, there is no reason why even growers of large numbers of fruit trees should not be able to protect them from the pests which are introduced and spread by ants.

CURRENT PUBLICATIONS.

The Agricultural Gazette of New South Wales, January, 1906.

The Application of Science and Scientific Method to Agriculture, by F. B. Guthrie. *February*—Fencing by G. L. Sutton; The Cultivation of the Castor Oil Plant by Q. Ercole.

March—Tomatoes and their Diseases by Walter L. Froggatt.

The Journal of the Department of Agriculture of Victoria, February, 1906. Surveying on the Farm; Levelling by A. S. Ken-

yon. *March, 1906*—Surveying on the Farm; Mensuration
 A. S. Kenyon; Strawberry Culture by James Lang.
The Queensland Agricultural Journal, March, 1906. Silage
 Silos. Poultry: Feeding and Fattening Chickens.
Bulletin of the Department of Agriculture, Jamaica, Febru-
1906. Grape Fruit and Shaddocks by Sir Daniel Morris.
The Florida Agriculturist, March 28, 1906. Making the
 of the Vegetable Garden. *April 4.* Citrus Fruit Pointer
Queensland Agricultural Journal, April, 1906. Chemistry
 sons on the Chemistry of the Farm, Dairy and Household
 J. C. Brännich. The Black Wattle in Hawaii and Nata
The Tropical Agriculturist, Ceylon, February, 1906. The
 cado: A Salad Fruit from the Tropics.

THE BANYAN TREE.

The Banyan tree (*Ficus Benghalensis*) is an East Indian of the order of Urticaceæ, and while extensively planted, is in a wild state only in the lower Himalayas and the Deccan. It has been raised in other lands, fine specimens being reared in Honolulu and elsewhere.

It is noted for its roots, which descend from the branches become accessory trunks, permitting the tree to extend over a wide area. As the tree ages the original trunk dies and decaying, leaving the younger trunk to support the life of the tree.

A banyan tree on the Nerbudda River is reported to have more than 3000 small trunks. Among these trunks and aisles it is said 7000 people could stand. This tree is now reduced in size by floods. The tree is not high, the maximum being usually about 70 feet.

The leaves are heart shaped, 5 to 6 inches long; the inconspicuous axillary flowers are succeeded by cherry-like scarlet growing in pairs from the axils of the leaves, which are eaten by the monkeys. The seeds seldom germinate on the ground usually among the leaf bases of palms, being deposited by the roots descending the palm trunks, embrace and finally kill them.

Its light porous wood, its juice and its fruit have no economic

uses. The bark is regarded by Hindu physicians as a powerful tonic. The white gelatinous juice is used to relieve toothache and reduce inflammation of the soles of the feet, also to make bird lime. Gum lac is obtained from the tree.

The Hindus regard the tree as sacred, and it is described by Southey in his poem, "The Curse of Kehama."

Its close relative, the *Ficus Indica*, is sometimes erroneously called the banyan tree.—*Forest Leaves*.

PRICKLY PEAR.

Experiments have been conducted by the Queensland Government to investigate the most satisfactory method of eradicating the prickly pear upon land which had been invaded by the persistent growth of this plant. The ground selected was very steep and covered with an almost impenetrable mass of the cactus. The men employed were protected against the sharp needles of the plant with leather leggings, and were armed with specially constructed mattocks with which they chopped the plant to the ground. The leaves and stem were cut into small pieces and sprayed with a solution of sodium arsenic. Under this treatment three or four days after the application of the spray the plants became brown, in which withered condition they soon rotted and disintegrated. The spray appears to have had no deleterious effect on other vegetation, although the roots of the cactus were so thoroughly destroyed that some months after the experiment no new growth of the plant was observed. The spray used was composed of four pounds of white arsenic and three pounds of washing soda, boiled for half an hour in one gallon of water. Of this concentrated solution about six ounces were used to a gallon of water for spraying.

WATER-CRESS.

Water-cress may be successfully grown on ordinary garden soil without the aid of running water. When water is laid on from pipes, water-cress will thrive as well as in a running stream. To cultivate on ordinary soil, prepare a bed of good mould about 6 inches deep. Smooth and water it in the evening, and next day reduce the soil to a fine tilth. Mix the

seed with fine sand, and sow as evenly as possible, and cover very lightly with a thin layer of mould. Press the seed down, water, and cover with matting. When the seed has sprouted, replace the matting with a shade of branches, and keep the soil quite moist. The plants soon grow; by and by they flower, when a new covering of mould is given them, leaving the plants about 1 inch above ground. Then water freely. Ten days later shoots will appear springing from the roots, which, when 2 or 3 inches high, are removed, and pricked out 3 or 4 inches apart in a new bed. A fortnight later the cress will be 6 inches high, when cropping may begin and continue right up to the first frosts, cutting every fortnight. Care must be taken to give copious waterings every evening. The seed should be sown in spring.—*Queensland Agricultural Journal*.

THE FARMERS' INSTITUTE.

NOTICE OF MEETING.

Honolulu, Hawaii, May 1, 1906.

The next regular meeting of the Farmers' Institute of Hawaii will be held at the Library of the Territorial Board of Agriculture and Forestry, on King street, Saturday, May 12, at 7:30 p. m.

The important subject of co-operative marketing of Hawaiian agricultural products is to be thoroughly discussed at this meeting, and a good attendance is hoped for.

The following program has been arranged:

Report of the Committee on Co-operative Marketing.

"The Necessity of Growing More Fruits in Hawaii," Mr. William Weinrich, Jr.

"Some Advantages of Co-operative Marketing," Mr. John Emmeluth.

Discussion.

All persons interested in the furtherance of Hawaii's agricultural interests are cordially invited.

(Signed) F. G. KRAUSS,
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The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Shower, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haugh, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.
Report of the Commissioner of Agriculture and Forestry for 1902; 83 pp.
First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.
"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

"On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and H. M. Newell. Circular No. 2; 4 pp., cut; 1905.

DIVISION OF FORESTRY.

"Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

*Out of Print.

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No. 5.

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. III.

MAY, 1906

No. 5

The excellent paper contained in this number by Dr. William T. Brigham, on the culture of the "alligator" pear, will be read with great interest. It embodies the substance of an address delivered by Dr. Brigham at the meeting of the Farmers' Institute at Kamehameha Schools last year, and completes the knowledge at present available to us on the culture of this esteemed fruit. We hope that the suggestion of the writer that the native name "palta" be substituted for the absurd "alligator pear" will be adopted. It is said that the tree was introduced by the Incas to the valley of Cuzco from the province of Palta, but whether the tree or the province has the priority of name is uncertain. At all events the Inca word should be given precedence to any of the extraordinary appellations by which this excellent fruit is designated. The Aztec name, as given by Hernandez, is "ahuacaquahuitl," which it is said means "resembling the oak." The Andulasian "aguacate" and the Castilian form "avocado" are without doubt Spanish attempts to pronounce the more unwieldy Aztec name, and the inappropriate and grotesque term "alligator" is said to be a corruption of one or other of these. The French name of the fruit, "avocat," is a modification of the Spanish "avocado" or "abogado," from which association the occasionally heard "Lawyer pear," has been evolved. The term "pear" is readily accounted for, as is also such names as "midshipman's butter," which formerly were more frequently applied. The botanical name "*Persea gratissima*" is more happily given, but for ordinary usage none is so appropriate or of such historic association as the original word "Palta."

Much valuable information relating to the cultivation of the Palta will be found in our March number of last year.

We are glad to present to our readers in this number an account by Mr. F. G. Krauss, with illustrations, of the first Silo erected in these Islands. The interest in this method of conserving fodder is rapidly gaining in favor in progressive countries, and it is a matter of surprise that it has been of so tardy introduction here. In order to produce milk to the best profitable advantage the silo is an indispensable adjunct to the modern dairyman. Its adaptability to so many different fodder crops renders it an easy matter to preserve the surplus amount for periods of shortage.

The most important problem facing the growers of fruit in Hawaii is that brought before the meeting of the Farmers' Institute on May 12th last by Mr. John Emmeluth. The necessity of concerted action by the pineapple and banana growers in order to market their products to the best advantage is unquestioned. Without some such equitable agreement the coast market is at any time liable to be glutted with Hawaiian fruit shipped from our various plantations, which are thereby brought into direct competition, one with another, to the general disadvantage of all. By means of a properly organized association controlling the Hawaiian output, and distributing it equally among the coast cities, our whole island production of fruit could be sold to satisfactory advantage. Such an organization is by no means a combination of growers working for their own benefit solely, but has its direct utility to the public at large by keeping it regularly supplied throughout the year with sound fruit, instead of leaving it to the irregular and precarious provision of chance. It is of the utmost importance that before the present season's output of pineapples is ready for shipment that the projected organization will have the subject well in hand, as the success of many small growers is dependent upon the efficient action of such a scheme as that advocated in Mr. Emmeluth's paper.

The Forester was fortunate enough to be able to obtain last year a series of monthly articles by Mr. F. G. Krauss, upon the vegetable garden. The practical experience contained in these has been of invaluable assistance to small growers, and we are continually being reminded of their appreciation. It is hoped that before long the Forester will be able to secure the interest and coöperation of an agriculturist sufficiently versed in our

local conditions, to write a series of papers upon the laying out and maintenance of ornamental flower gardens. In spite of our splendid climate, flowers which succeed admirably in the country of their production as a rule require especial care and treatment in Hawaii. Such knowledge can only be acquired by long observation and practical experience. There are, however, a number of hardy plants which readily adapt themselves to our conditions and flower profusely here with a minimum of cultivation.

The love of flowers is too often confined to the placid content of admiring them in another's garden, but we would see Honolulu a veritable city of flowers, and one in which every house lot has its properly cared-for flowering plants. Foliage plants are a valuable ornament to any garden, but one should not be content to abandon one's whole yard solely to these. A properly directed taste for flowers should be an essential feature in the education of the young, and is one of the best means to beautify the home and render it bright and attractive.

However small a house lot may be, it should be arranged in some systematic plan in conformity with its general shape and contour and in harmony with the house which it is to ornament. Probably nothing adds so much to the attractiveness of a small home as a well kept lawn surrounded with neatly trimmed borders. Beyond these, as space permits, there should be first placed flower beds and then clumps of attractive crotons, dracænas and other foliage plants, set out in such a way that the larger are in the background. Care should be taken not to cumber valuable space with unsightly or unseen plants, but to have the few so arranged that all are ornamental and displayed to advantage. Shrubs should be pruned within bounds, but this should be judiciously done in such a way as not to appear mutilated or dwarfed.

Foliage pot plants are easily grown and should be made extensive use of. Of these begonias, caladiums, ferns, small palms and orchids are among the most useful. It must be remembered that with these, as with every other gardening operation, the degree of success attained will be commensurate with the care and attention bestowed. In preparing soil for potted plants, leaf mold, well rotted manure, road scrapings, decayed or chopped cocoanut fibre, fine sand, broken charcoal

and pot sherds, each have their proper use. After planting, a layer of moss, leaves or fibre placed upon the surface of the pot will serve to keep the drainage from becoming clogged and will prevent too rapid evaporation.

The approach of the fruit season calls attention to the mango, which is probably the most extensively grown fruit tree in Hawaii. It is extremely easy to propagate, grows quickly and fully repays with an abundant crop the space which is given up to it. It is unfortunate, however, that in spite of the fact that it responds readily to cultivation, its care is so neglected and that so many inferior kinds are tolerated. There is little excuse for this, as a choice tree takes up no more ground and produces a fruit of delicious flavor and creamy consistency, instead of the fibrous and turpentine varieties so prevalent in Honolulu. Many fine varieties of mango are to be found in and around the city, those cultivated at Mr. Damon's Moanalua estate being probably best known. Much successful work has been done by Messrs. Gerrit P. Wilder and Donald MacIntyre in budding and grafting mangoes, and we would advise all those who have trees with which they are not satisfied to consult one or other of these gentlemen as to how they may be improved by these means. The May number of the Forester for 1905 contains a full description by Mr. MacIntyre of the various processes of grafting, which could be successfully accomplished by anyone familiar with garden operations.

We are in receipt of a communication from Mr. William Dutcher, President of the National Association of Audubon Societies, in which he desires us to bring the attention of readers of the Forester to the work the association is engaged in. He also sends a number of interesting pamphlets written with the view of disseminating a proper knowledge of the utility of bird life. The association was founded in order to protect wild birds and animals from useless destruction, and from the information at our disposal we are able to give in this number an account of the inception of the movement which finally culminated in the organization referred to. The disappearance of our beautiful Hawaiian birds is a matter of great regret, and the absence of indigenous birds in many districts cannot but exercise a detrimental effect upon agriculture by allowing

many entomological pests to go immune from bird attack. A proper and enlightened knowledge of the economic importance to Agriculture of different species of birds is very desirable, and much useful and instructive information on this subject is contained in the Audubon Societies' publications, which we shall be glad to place at the disposal of any of our readers who may be interested in this matter.

THE BRICK-RED BOUGAINVILLEA.

The ordinary varieties of bougainvilleas may readily be propagated from cuttings. The handsome brick-red one unfortunately presents more difficulties, and cuttings from it rarely succeed. It is said to be capable of propagation by circumposition, a somewhat tedious operation.

PLANTING OF COCO-NUTS.

Although the coco-palm is very productive when favorably planted, there are two kinds of soil on which it will not grow profitably. Upon thin soil overlying rocky foundations and upon compact clayey soil which retains water, no generous growth will be maintained. The best sites are to be found upon level lands exposed to the sea breeze where the soil is good, as in valleys which have been filled up with rich humus from the hills, and along river banks. Where the soil is rich the crops will be enormous. A loamy sand is also very favorable to good development.

In preparing the holes for planting coco-nuts they should be made about three feet deep, and filled in to half their depth with soil from the surrounding surface. A plant so started will gain perceptibly upon one set in too small a hole.

REMARKS ON THE PALTA OR AVOCADO PEAR.

By William T. Brigham.

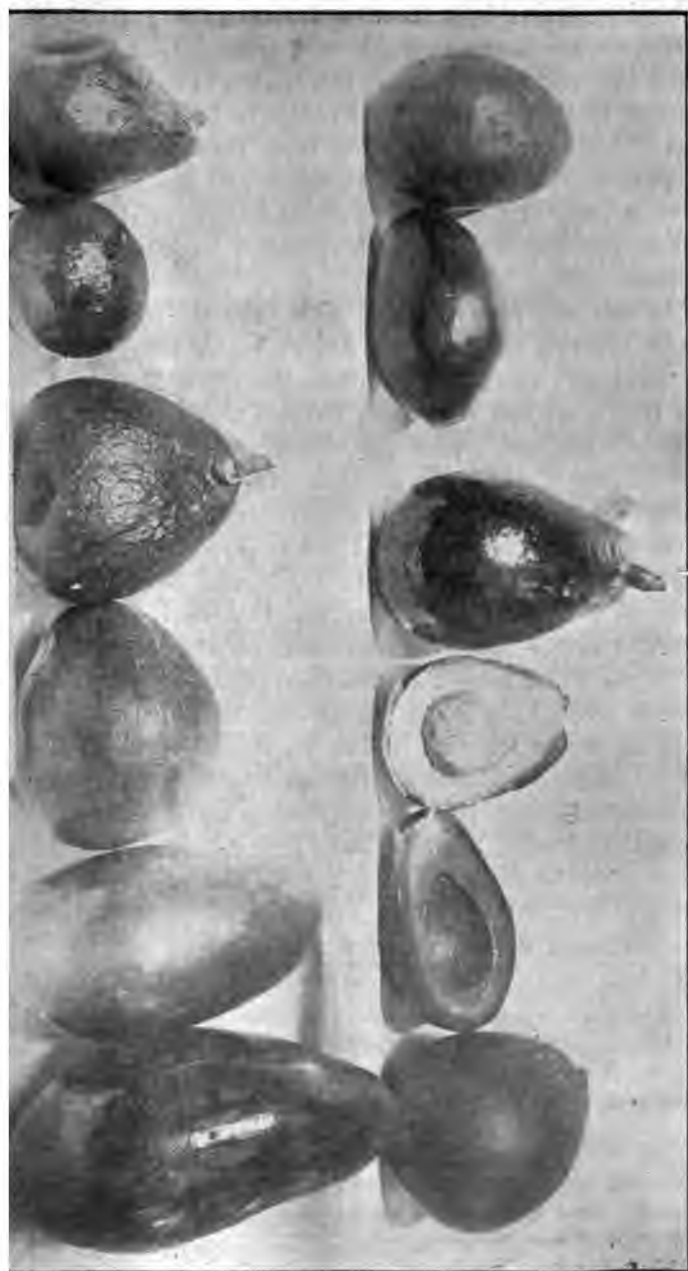
Forty-one years ago the best palta tree in Honolulu was in Judge Montgomery's garden, the place now occupied by the St. Louis College. It was of the purple variety and the judge kindly sent one of these rare fruits to Horace Mann and myself, who had recently come to these islands. We neither of us liked this fruit, at which the giver expressed his satisfaction, "as there were not enough to go around."

Near the head of Pauoa valley was a very neglected tree, which, in my botanizing rambles, I at first took for a part of the forest, but on examining the fruit found it a small green pear. It was the first tree of the kind I had seen, and I afterwards learned that it had been planted by the Spaniard Manini or Marini, who introduced so many good fruits. On Kauai at the Princeville estate belonging to R. C. Wyllie, Hawaii's greatest Minister of Foreign Affairs, I found a tree bearing a rough-skinned green fruit, which I learned to like although it was far inferior to those now cultivated in Honolulu. On Hawaii were the largest and oldest palta trees. Mr. Wyllie was consul for Peru or Chili, or perhaps both, and may have imported the fruit, but he was not the first one, for the paltas were here in 1825.

The wood of the *Persca gratissima* is of fine grain and rich color, and at one time was in great demand in England for furniture under the name of Barbados mahogany. Specimens in the Bishop Museum from one of the large trees of Hilo certainly show a pleasing cabinet wood.

My object this evening, however, is not to describe all the history and good qualities of this favorite fruit, which I wish we could call by its original Spanish-American name of Palta in place of the absurd avocado or lawyer pear, or the stupid corruption alligator pear. I intend only to give you briefly some of my experience in cultivating this fruit. We here are all too ready to merely plant the seed and do nothing more: we "push the button" and leave the rest to Providence. This institute is established, I believe, to help us to make some exertion ourselves, and by so doing better our products.

In 1888 I was supplied with very good paltas of the pur-



ple variety grown by a friend in Pauoa valley. As these were of one variety I selected the best fruits,—that is those that tasted best and had the best form without consideration of the bearing qualities of the parent tree. In 1890 I took six of the most vigorous plants resulting from these selected seeds to my present residence on Judd street and planted all but one in the ground on the lee side of the house, as this tree needs shelter from the winds, which are often strong in that part of Nuuanu valley.

The soil was not originally good, and the place was rocky, but by blasting out the most objectionable ledges and replacing them with earth removed from the site of the house, which was then enriched with both natural and chemical manures, a fair chance was given the young trees, which grew well. The fruiting results were curious. One on a more rocky bed produced a small green fruit much inferior to the parent, and as the tree was in the way I cut it down. Another tree in perhaps the richest part of the yard grew well, but the fruit of the first bearing was green, rough-skinned and watery; it is shown in the first two specimens on the left of the lower line in the illustration. It was disappointing, but careful cultivation wrought a great change the next year, the product being shown in the two middle specimens of the lower line, and the change was not merely one of size but the quality of the fruit was entirely changed from a watery, tasteless fruit to a pale yellow, rich, custard-like fruit not so oily as the average pear of the market. It is a good bearer, yearly, and the fruit sets well, but does not keep as well as the purple varieties, although the skin is thick and tough.

My best tree so far as growth and size and quality of fruit go, is one for which I had no very good place and so left it in the box in which it was transported from the nursery. In time the bottom of the box rotted, the roots penetrated deep into a rich bed around a fountain basin, and as the tree grew very luxuriantly, I left it to fruit and show its quality. The result was a long smooth, green fruit with a rich, dark orange, nutty-flavored meat and very small seed. The two fruits shown on the right of the lower line were from this tree and weighed 32 and 33 ounces. So far as the quality of the fruit is concerned, I could ask for nothing better, but while the tree blossoms early with the greatest profusion, very few fruits

come to maturity, and these are apt to decay at the stem end if not picked promptly.

Another tree much resembled the parent, and the fruit is shown in the left hand figure, upper line; it was purple. The best all-round tree of the lot bears annually a good crop of well-sized (16 to 18 oz.) purple fruit shown in the remaining specimens on the upper line of the figure. These, as will be seen from the sectional specimen, have sufficient meat and medium sized seed. Keeping qualities are good and they have been sent to Sydney, N. S. W., in good condition, and on the tree a succession of fruits has extended the season to six months (April to October).

Here then are marked variations from a single tree that would have given Mr. Luther Burbank great pleasure and a fine chance to develop better points. But Mr. Burbank's process is no secret, and the way is open to you gentlemen of this institute to modify the Palta to such forms and qualities as may better serve the needs of transportation and the palates of those to whom this delicious fruit is strange. I know of no fruit where the principle of variation is more marked, or which yields more readily to treatment. If it be thought worth the while, we have a good stock to experiment upon, for I have tasted the West Indian varieties and those of Guatemala, and to my taste the fruit grown on these islands is superior to these competitors. I have not eaten the fruit from the west coast of South America, probably its native soil, but I know fairly well the little cultivation it gets there, and I am convinced that without cultivation, the finest qualities of the Palta never appear.

SHIPMENT OF ALLIGATOR PEARS.

The alligator pear can be shipped in cold storage. Successful shipments have been made by the Hawaii Experiment Station, as far East as New York City. This salad or breakfast fruit is one commanding special prices for fruits of good size and quality. Selected shipments sell for from \$4 to \$6 per dozen, in San Francisco. The local demand is also large and local prices are quite satisfactory. The alligator pear is a tree susceptible of orchard cultivation, requiring less water than citrus fruits. It grows better at the lower than at the higher elevations, seldom producing a crop of fruit when grown above 2000 feet. It likes protection from winds.—*Jared Smith.*

THE SILO IN HAWAII.

The recently constructed silo at the Kamehameha Schools' farm and its storage with silage for the first time on the 16th inst., has occasioned much interest among the several agriculturists who are watching the experiment and recognize its value to Hawaiian agriculture if successful.

While the practical preservation of green fodder in silos* dates back to a hundred or more years ago, European husbandmen being the first to make this application of the ancient's practice of storing grains in pits, the ensiling system was not introduced into America until 1879 upon the appearance of a translation of A. Gaffart's noted French work on "ensilage."

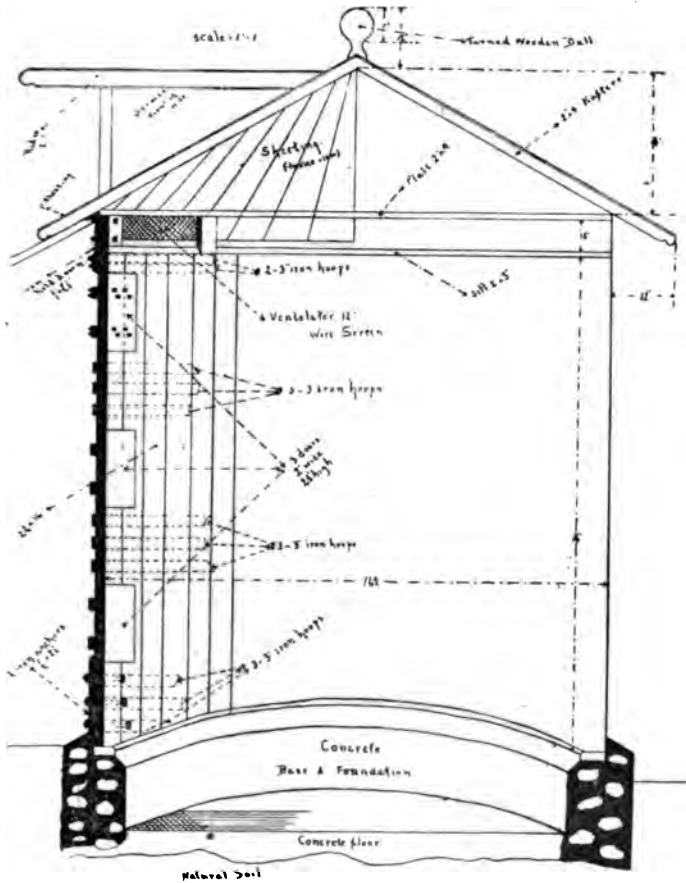
Since then the silo has made wonderful progress in the United States—numbering 91 in 1882, it is estimated that half a million are now in operation throughout the Union—where ensilage is almost universally recognized as one of the most economical and satisfactory food stuffs obtainable for dairy cattle.

The several recent successive dry years in Hawaii and the consequent shortage of green, succulent pasture and fodder for dairy cattle for the greater part of the year, led the writer to investigate the adaptability of the silo to Hawaiian conditions. While in California in the fall of 1904, a number of leading dairies where the modern silo formed an important feature were visited, five silos, varying from 100 to 250 tons capacity, in operation from one to four years, were carefully studied. Reports and observations were so favorable in this investigation, where climatic and other conditions were so nearly like our own, that the experiment of introducing the silo into Hawaii seemed well worth while.

A 65-ton silo was planned for use on the schools' farm last fall; the staves of a 20,000-gallon water tank being available, these were utilized for the body of our silo. By inverting each alternating stave, the tapering form of the tank was converted into a perfect cylinder 16 feet in diameter and 18 feet in height. This was set upon a concrete foundation which also formed

**Silo*—an air-tight structure used for the preservation of green fodder in a succulent condition.

Silage—the feed stored in a silo (formerly called ensilage).

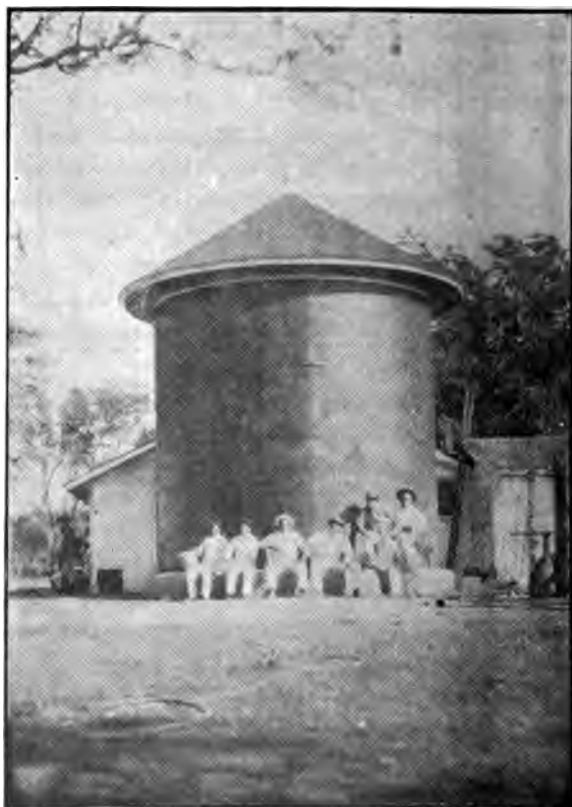


the walls of a thirty-inch pit, giving the silo a total depth of about 20 feet.

The top of the silo is capped with a shingled conical-shaped roof; immediately under the roof, an open space, a foot in width, is provided for ventilation. Three doors, one above the other, and facing the barn, provide an easy means for removal of the silage, but the filling is done through a dormer window in the roof. The plan and pictures herewith will give a good idea of the construction and general appearance of the Kamehameha silo.

The more important requisites of a silo are that its walls should be as nearly air-tight as possible, else the loss from ex-

cessive decay of the silage will be very great. The structure must be rigid, and the inner surface smooth and uniform, so as to facilitate the rapid and complete settling of the silage, and it should be built of durable material. Then the fodder should be of suitable kind and at the proper stage of maturity.



KAMEHAMEHA SCHOOLS' SILO

Hawaii's First Silo; Completed March 15, 1906. Filled April 15, 1906.

Indian corn, all things considered, has thus far proven the most satisfactory silage crop. It should be harvested when the seed begins to glaze, and the whole plant utilized.

In practice it is difficult to make the silo absolutely air-tight, so that even in the best built structures there is some unavoidable loss; this is variously estimated at from 5 to 12 per cent.

The surface layer, which rots to a depth of from 3 to 6 inches, seals the mass below, no further covering being necessary.

After feeding begins, which may be at any time after active fermentation has ceased, a sufficient quantity, say from four to six inches, must be fed off daily to keep ahead of mould and decay which results from each fresh exposure to the atmosphere. The number of cattle fed should govern the diameter of the silo—if 20 head of cattle are to be fed 30 pounds silage daily, a 16-foot circular silo would permit of sufficient removal to keep in advance of decay. Silage weighs from 35 to 60 pounds per cubic foot. Other things being equal, the deep,



FODDER CORN FOR SILAGE KAMEHAMEHA FARM APR. 15, '06

Part of four acres, Indian Corn, Sorghum and Cow-peas used in filling Kamehameha School's Silo.

narrow silo preserves the fodder best; this is owing to the fodder mass becoming more compacted, thus excluding more air.

Silos are now constructed of wood, brick, stone and concrete, and of from 50 to 350 tons capacity. Wood is, of course, the cheapest in first cost and is the material most used. There are several methods of construction; the stave silo, on the plans of which the Kamehameha silo is built, is the simplest and cheapest of the round form, but has some short-comings, chief of which is its tendency to dry out and shrink when empty, making it difficult to restore it to an air-tight con-

dition upon refilling. Complete stave silos are now offered for sale in a "knocked-down" form, the staves carefully matched and tongued and grooved and are said to give entire satisfaction.

A better construction is what is called the "Wisconsin" or "King" type of silo, which consists of 2"x4" studding set on end, a foot apart around the circular concrete foundation. To these is attached the lining consisting of two layers of half-inch sheeting put on horizontally, with a well lapped layer of water-proof paper between. No outside weather-boarding is necessary, though it adds greatly to the strength and appearance of the silo.

Square or rectangular form are no longer advocated; the difficulty of settling the silage evenly, especially in the corners, and preventing the walls from bulging, are the main reasons for their disfavor.

Nearly all the solid stemmed fodder crops seem adapted for silage, but the grasses having hollow stems, which offer recesses for air, do not ensilage well.

Indian corn is doubtless the best of all silage crops, as it yields heavily of a superior fodder, which keeps perfectly under favorable conditions. Alfalfa, sorghum and cow-peas are also excellent crops for ensilaging.

For experimental purposes at Kamehameha this year, a dent variety of larger yellow field corn, sorghum and cow-peas were grown as silage crops and were placed in the silo in layers after being cut into half-inch lengths with an ordinary fodder cutter.

The average yields on good soils, but with a lack of water for irrigation, were 23 tons for the corn, 14 tons for the sorghum and 9 tons per acre for the cow-peas. In favorable seasons we have had much larger yields.

It was intended, also, to fill part of the silo with sugar-cane tops, it being suggested that this otherwise largely wasted material might be utilized for silage to good advantage, though it is as yet a question whether or not the relatively large sugar content will develop an excess of acid during fermentation. It is an experiment well worth trying. Doubtless,

other tropical and semi-tropical fodders that flourish during seasons of rainfall may be profitably ensilaged and thus a succulent feed be made available during seasons of drought as at present.

Summary.

1. The silo has come to stay in all dairy sections of the United States where thus far tried.

2. Southern and California dairymen, whose conditions are not unlike our own, are loud in its praise.

3. Because, silage provides nutritious, succulent food for dairy stock at a time of the year when such vegetation is scarce.

4. It is not advisable to feed silage alone; for mature cattle, 25 to 35 pounds per day is a reasonable allowance; a small amount of hay and the usual amount of grain should be added.

5. Of the green fodders suited to silage, India corn, alfalfa, sorghum and cow-peas are the best and cheapest thus far known. All thrive in parts of Hawaii.

6. The best time to harvest any green crop for silage is at or near maturity, before the leaves turn yellow; at this stage they contain the greatest amount of nutriment, and fermentation is least active.

7. On an average, 3 tons of silage are equal in feeding value to 1 ton of well cured hay.

8. The silo provides a more economical and compact method of storing fodder than the hay mow.

9. The silo is especially adapted to intensive farming, where land is high in value and storage space is limited.

10. A carelessly constructed silo is an extravagance and cannot give satisfaction.

The results of this first experiment with the silo in Hawaii is awaited with deep interest. A more full account will be published after the feeding of the silage is begun.

F. G. KRAUSS.

Agriculturist Kamehameha Schools.

*"AGRICULTURAL POSSIBILITIES OF THE TERRITORY
OF HAWAII."*

A publication under the above title, issued by the Hawaii Promotion Committee and written by Mr. Jared G. Smith, special agent in charge of the U. S. Experiment Station in this Territory, deserves more than passing attention. The pamphlet commences with a brief and interesting description of the climate of the islands, which we are glad to see is described as "sub-tropical." The statement is too often expressed by those who have the best interests of Hawaii at heart, that the islands are "tropical." Although our islands actually lie within the tropic zone, those who have knowledge of the intense and enervating heat of a truly tropical country, are reluctant to apply a term to our equable climate which can only create an impression upon those who hear it, of an existence where every effort is a burden in consequence of the excessive temperature. The insular position of these islands, which are fanned by invigorating trade winds for most of the year, in spite of our geographic condition, renders our climate not only well nigh uniform throughout the year, but also sufficiently moderate in our hottest months to allow of all the physical exercise and exposure to the sun, as can be enjoyed in a temperate country.

After a brief account of the different soils of the islands the pamphlet gives a description of the various agricultural industries established here. It is not difficult to see that not only is Mr. Smith an enthusiastic lover of Hawaii and a thorough believer in its future agricultural development, but is, in addition, perfectly conversant with every phase of the subject on which he is writing.

As the publication is primarily intended for mainland agriculturists, who may desire to obtain information of our local industries, little space is occupied with our principal crop, sugar, as its cultivation is generally in the hands of companies possessing large capital.

The pineapple, sisal, banana and coffee industries are treated of at greater length, and then follows a more descriptive article on the newer and at present little known tobacco industry. The Hawaiian Experiment Station has now been conducting

investigations for three years to determine whether good tobacco can be grown in the islands. Most favorable results have been obtained. The experiments were conducted in Hamakua, Hawaii, where the chief types of commercial tobacco are being grown. The final results indicate that wrapper tobaccos of fine texture, and body and filler leaf of mild flavor and good burning qualities, are a commercial possibility. The flavor of the Hawaiian grown tobacco is said to be distinct and to lie between that of the Manila and Cuban products. It is believed that our island tobacco can be sold on its peculiar and intrinsic merits. There are at least 100,000 acres of land in Hawaii where the physical character of the soil is right for growing this crop. It is estimated by Mr. Smith that a grower may produce tobacco on his own land and with the labor of his own family at a cost of from 2 to 2½ cents per pound of green leaf, equal to from 10 to 12½ cents per pound of barn-cured tobacco.

Hawaiian tobacco grows wild throughout the islands without cultivation, and has reverted to its original type. The old Hawaiians recognize certain limited districts as producing superior tobacco, the best grades of which are sold at about 50 cents per pound.

Vanilla, another new and promising industry, is then dealt with. The bean from which this esteemed flavoring is obtained, is the cured fruit of a climbing orchid, which is not produced unless the flowers are hand pollinated. This is a delicate operation, not difficult to learn. The fruit pods are gathered before ripe and are cured by sweating while green in the direct sunlight between folds of woolen blankets. The yield per acre in Hawaii has been estimated at about 13,000 pods, equal to 120 pounds of cured beans. The industry is very profitable to one having sufficient means who will give it personal supervision. Five acres of vanilla, in bearing, should yield a crop valued at from \$2000 to \$2500, but there will first be an unproductive period of about three years.

The silk industry has been another source of valuable experiment, conducted by the Experiment Station, which has lately produced a crop pronounced by experts as "well worthy of being graded as first class." Eggs for experimental purpose and also mulberry cuttings will be furnished free of charge by the Station, so far as possible, together with full

information relative to the care of silk worms. The industry is not suited for women and children as has often been stated, but it requires a man's full time during the whole period from the hatching of the eggs until the transformation to the cocoon takes place. The industry is suggested to those whose established occupation is in progress only a portion of the year.

Dairying, poultry, vegetables, fruits, bees, stock raising and rubber all come in for generous treatment.

The pamphlet in question is well written and presents a mass of valuable material in a thoroughly interesting way. It should be widely read by residents of this Territory and be sent to all who are interested in the development of Hawaii.

NON-FRUITING OF MELON VINES.

Many practical gardeners hold the opinion that some plants, like the cabbage, and also pumpkins and melons, head and fruit better when old seeds (two to three years of age) are sown. This is an exception to the general rule, which shows that fresh seeds possess a higher germinating power and produce more vigorous plants. A French experimenter, Cazziola, found that melon and squashes raised from fresh seeds bore a larger proportion of male (*staminate*) than female (*pistillate*) flowers, while older seeds bore more female than male flowers. This may be the reason of the scarcity of female flowers in certain cases. It is well known, however, that male flowers of plants of the melon and squash tribe usually appear five to six days before the female flowers, and also that they are much more numerous than female flowers. In this way while plenty of pollen is provided, self fertilisation of the female flowers by the male flowers of the same plant is checked, and cross fertilisation, aided by the agency of insects and wind, is made easier. As a general rule, a practical result of cross fertilisations, is that more vigorous and hardier subjects issue. Some gardeners affirm that when growing pumpkins or melons it is advisable to mix a small proportion of new seed with the older seed, to provide vigorous and leafy vines with an abundance of pollen.—*Journal of Agriculture, W. A.*

NATIONAL ASSOCIATION OF AUDUBON SOCIETIES.

The wholesale destruction of wild birds during the last few decades of the last century had assumed such proportions that it was foreseen that if this were allowed to continue unchecked, it would be but a short time before the majority of the most beautiful species of American birds would be extinct. A writer, in "Forest and Stream," stated in 1884: "The destruction of American wild birds for millinery purposes has assumed stupendous proportions. The unholy work gives employment to a vast army of men and women, and this army wages its campaign of destruction with a dreadful perfection of system." The editorial refers to details of the work published in other columns of the paper, which furnish evidence of the systematic character of the business. It was during this year that the work of exterminating the Terns commenced and the destruction was carried on from Florida to Massachusetts, and hundreds of thousands of these beautiful and graceful creatures were sacrificed on the altar of fashion. Today the small remnant of the once countless throngs of Terns, or Sea Swallows, are being carefully guarded by wardens in the employ of the Audubon Society, who are paid from the Thayer Fund. They now live in peace and happiness, are permitted to breed in security, and, thanks to a growing sentiment of kindness to all wild life, are rapidly increasing in numbers.

In the minutes of the second annual meeting of the American Ornithologists' Union, held at the American Museum of Natural History in New York, September 30, 1884, may be found the following entry: "Mr. Brewster called attention to the wholesale slaughter of birds, particularly Terns, along our coast, for millinery purposes, giving some startling statistics of this destruction, and moved the appointment of a committee for the Protection of North American birds and their eggs against wanton and indiscriminate destruction, the committee to consist of six, with power to increase its number, and to coöperate with other existing protective associations having similar objects in view. After earnest support of the motion it was unanimously adopted."

At this same meeting action was taken which proved far

more reaching in its results than was probably anticipated by its originators. The American Ornithologists' Union instructed the Council to prepare and present a proper memorial to Congress, and also to the Canadian Government, in behalf of the Committee on Bird Migration, and to consider what other means could be devised to promote the work. As the result of the appeal to Congress, an appropriation of \$5,000 in aid of the work was secured through the United States Department of Agriculture, and from this humble beginning has grown the present Biological Survey, a Division of the United States Department of Agriculture, which still has at its head Dr. Merriam, the original superintendent, who has gathered about him a staff of well-known ornithologists.

The great value of the work of this important division of the Government is becoming more and more apparent every year, especially in the great mass of educational material that is being published, and in the active part it is taking in the work of protecting both game and non-game birds.

An editorial entitled "The Audubon Society" appeared February 11, 1886, in "Forest and Stream," from which is quoted some facts relating to the organization of the first Audubon Society:

"Very slowly the public are awakening to see that the fashion of wearing feathers and skins of birds is abominable. Legislation of itself can do little against this barbarous practice, but if public sentiment can be aroused against it, it will die a speedy death. While individual effort may accomplish much, it will work but slowly, and the spread of the movement will be but gradual. Something more than this is needed.

"In the first half of this century there lived a man who did more to teach Americans about birds of their own land than any other who ever lived. His beautiful and spirited paintings and his charming and tender accounts of the habits of his favorites have made him immortal, and have inspired his countrymen with an ardent love for the birds. The land which produced the painter-naturalist, John James Audubon, will not willingly see the beautiful forms he loved so well exterminated.

"We propose the formation of an Association for the protection of wild birds and their eggs, which shall be called the Audubon Society. Its membership is to be free to every one who is willing to lend a helping hand in forwarding the objects for which it is formed. These objects shall be to prevent, so far as possible, (1) the killing of any wild birds not used for food; (2) the destruction of nests or eggs of any wild bird, and (3) the wearing of feathers as ornaments or trimming for dress.

At the end of the first six months of its existence the Audubon Society had enrolled over 11,000 members, and it was deemed necessary to incorporate. Steps were taken to that end, and on August 6, 1886, the incorporation was completed in the city of New York, with the corporate title of "The Audubon Society for the Protection of Birds."

During 1888 the tide of bird protection rapidly declined, for the subject seemed to be given little attention in the public press. "Forest and Stream," in an editorial in November, said as follows:

"Essays have been written to demonstrate the foolishness of small bird destruction, laws have been passed to protect the useful species, societies have been organized and tens of thousands of members enrolled pledged against the fatuous fashion of wearing bird skins as dress; arguments, pleas, appeals to reason and appeals to sentiment have been urged; and what is the outcome of it all? Fashion decrees feathers; and feathers it is. The headgear of women is made up in as large a degree as ever before of the various parts of small birds. Thousands and millions of birds are displayed in every conceivable shape on the hats and bonnets. This condition of affairs must be something of a shock to the leaders of the Audubon Society, who were sanguine enough to believe that the moral idea represented by their movement would be efficacious to influence society at large. Meantime the reintroduction of feather millinery in no way derogates from the value of the work done by the Audubon Society. It has called attention to the ethical and economic aspects of the question and has educated a very respectable minority to organized action. In the face of this minority thoroughly convinced that indulgence in feather millinery is wrong in itself, or conducive to consequences inimical to human well-being, the arbiters of fashion cannot achieve that complete success they have been accustomed to look for."

By December, 1888, organized effort for bird protection in the United States had practically ceased to exist.

An analysis of the cause of the decline in this important work points to the following reasons: The movement was started and carried on as a single society, the expenses of the same being borne by a liberal and public-spirited corporation that was organized for another purpose. The magnitude of the undertaking was too great for any person or corporation to carry on unaided, the actual physical labor and the great expense were beyond the strength or purse of anything but a coöperative movement among the several states and the contributions of hundreds of individuals. There was also a total lack

of supporting laws, nor was the warden system adopted during the first movement.

The second cycle of bird protection practically commenced in January, 1896, when the system of State Audubon Societies was started by the organization of a society in Massachusetts; this was followed by one in Pennsylvania, and thereafter state organizations followed in rapid succession, until now there are societies in thirty-five states, one territory and the District of Columbia. Many of these societies are large and flourishing ones, some of them being incorporated. The Society in North Carolina is unique in that it acts in that state as a Game Commission with power of appointing bird and game-wardens who can arrest violators of the game laws.

Uniform bird legislation was found to be absolutely necessary and has rapidly been secured, so that at this date the model law is in force in twenty-eight states, one territory and the Northwest Territories in the British Provinces. In addition, the Audubon Societies, individually and through the National Association, have exerted a vast and valuable influence in game-bird protection, having found it impossible not to become interested and involved in this important branch of economics. All of the societies stand emphatically for short open seasons, no spring shooting, non-export, no sale of game, and every known method of preserving the rapidly diminishing game-birds of the country.

Early in 1900 Fashion had again attacked the Gulls and Terns, and dealers said that the demand for these skins far exceeded the supply. An appeal to bird lovers was made by Mr. Abbott H. Thayer, and through his efforts a generous fund was raised which was used for special protection to seabirds during the breeding season, wardens being employed for this purpose. Mr. Thayer has diligently and patiently worked to continue the fund from year to year, with annually increasing results, so that during the past year thirty-four wardens have been employed, as follows: Maine, 10; Massachusetts, 1; New York, 2; New Jersey, 2; Virginia, 8; North Carolina, 4; Florida, 4; Texas, 1; Michigan, 1; Oregon, 1, and a contract has just been made with a warden in Louisiana.

In November, 1900, an important meeting took place in Cambridge, having as its object the discussion of the Federation of the State Audubon Societies in order to strengthen

the bird-protection movement and more effectually place it upon a lasting basis. A committee was appointed, which reported at a meeting held in New York in November, 1901, as follows:

1. That the several societies retain their individuality, that is, that they be not merged into a National Organization.
2. But in view of the increased efficiency that would always result from some form of union, which would admit of concerted action, it is recommended that,
3. The several societies shall each appoint one member of a committee to be known as the National Committee of the Audubon Societies of America.
4. That the members of the committee may be empowered to represent the societies whenever concerted action on the part of the societies be deemed by the committee expedient.
5. That an annual conference be held.

Since 1901, the National Committee has had charge of the formation of new Audubon Societies, the fostering and encouragement of the new and weaker organizations, the warden system, legislation, and general educational work, and it is also an additional medium of exchange between the several state societies.

In 1904, two communications brought before the National Committee have a direct bearing on bird life of the Pacific, and as the information contained therein is probably not known to many of our readers, they are given below:

Dr. Richmond, writing in behalf of the Smithsonian Institution, says: "We have recently received from the Treasury Department several specimens of birds from the island of Lisiansky, one of the outlying Hawaiian islets, with the following history: Capt. O. C. Hamlet, of the Revenue Cutter Service, commanding the U. S. S. 'Thetis,' was sent to this island for the purpose of taking away certain Japanese who were unlawfully engaged in the killing of birds. No doubt these fellows were collecting plume-birds. The skins were made by the Japanese and have no data or labels attached. The species represented one Albatross, one Tropic Bird and three Terns."

The newspaper account of this slaughter is correct and is given herewith:

"Special Correspondence of the 'Chronicle.'

HONOLULU, June 23.—Captain Hamlet, of the *Thetis*, states that the destruction wrought by the party of Japanese poachers on Lisiansky island to bird life was something appalling. He estimates that they killed at least 300,000 birds, to judge from the number of cases of plumage and the amount of meat they secured. All of their spoil had to be abandoned, but it is properly preserved and will keep for a long time. There are 335 of these cases, the plumage in them being of the highest quality.

"The Japanese who were brought here by the *Thetis* are the remains of a party of bird poachers whose presence on an American island was reported by Captain Niblack, of the United States steamer *Iroquois*, some weeks ago, and the *Thetis* was sent to stop their operations, but she arrived to find them only too anxious to leave their hunting-ground and to abandon spoil which is worth at least \$20,000.

"The Japanese were employed by a Tokio firm, and they fitted out in the schooner *Yeiju Maru* in Yokohama last December. Their destination was Lisiansky Island, a wonderful center of ocean-bird life in mid-Pacific not far from Midway Island. The island is the property of the United States.

"According to their story, they arrived at Lisiansky Island on January 8, and commenced at once to kill birds. They had a staff not only of hunters, but also of skilled taxidermists and skimmers, for the birds' plumage was intended for the millinery markets of Paris. The men collected skins and wings by the thousand, the birds being very tame."

The following is the report for 1904 of Mr. W. Alanson Bryan, of the Bernice Pauahi Bishop Museum of Honolulu, a member of the committee:

"As yet no effort has been made to organize an Audubon Society in the Hawaiian Islands, although the matter is under consideration and we hope to be able to effect an organization within the coming year.

"The annexation of Hawaii by the United States has necessitated the recasting of many of the fundamental laws of the country, and, in consequence of the unusual amount of urgent legislation before the local assembly, the modification of the game laws has been deferred; although the subject has been thoroughly discussed and a model bill is at hand which will be presented as soon as it is possible to secure its consideration by the legislature.

"When compared with any other state in the Union, it will be observed that an unusually large proportion of the native land-birds of Hawaii are now considered as being extinct. Fortunately their extermination has been brought about by

which it would have been impossible to cover by legis-

subject of the introduction of desirable birds has re-attention in years past. As a result, all of the larger have more or less thriving colonies of introduced birds of several species. The people are aroused to the importance of the introduction of beneficial insectivorous birds, and indications point to the subject receiving sub-encouragement at no distant date.

leaflets and circulars distributed by the Audubon have little bearing on our local conditions, as none of the species treated are found here. However, the matter contained in them is of general interest and stimulates observational inquiry."

NOTES.

By Jared G. Smith.

bud-rot of carnations is caused by a species of *Fusarium* and the fungus is always accompanied by a mite which probably acts as a carrier of the disease, intensifying its effect by sapping the vitality of the plant. Inoculations with cultures of the fungus indicate that the *Fusarium* may cause bud-rot. There is considerable variation among varieties in their susceptibility to infection.—F. D. in Proc. Nebr. Acad. Sci.

an exchange is "The Strawberry," a monthly magazine devoted to this fruit, published by The Kellogg Publishing Company, Free Rivers, Michigan. The cover bears the motto: "The word might have made a better thing than the Strawberry—but He didn't."

Hawaii Experiment Station would like to get copies of Bulletin No. 4, "The Cultivation of Sisal," by F. E. Conter, and Bulletin No. 6, on "Vanilla Culture." The edition of each is exhausted.

INSECT PESTS IN HAWAII.

The farmers of Hawaii, in common with those of all other countries, will be confronted by serious obstacles, which must be overcome. One of the most serious problems is that of controlling the many injurious insects. As in all other tropical countries, insects are much in evidence. The pests in Hawaii are almost entirely forms which have been introduced from other countries. The principal insects injurious to fruits are the scale-insects, mealy bugs and related species. The sugar planters have to contend with a cane-borer, a leaf-hopper, mole crickets, and others of a more or less destructive nature. Plant-lice, cut-worms, melon-flies, and various leaf-eating beetles, attack garden and field crops. Grapes, ornamental trees and shrubs suffer from Japanese beetles and Fuller's rose beetle. However, it is well to remember that the use of direct, active measures of control will keep these pests in check in Hawaii just as similar methods are used against insect pests on the Mainland. It is certain that precautionary methods, the use of insecticides and cultivation based on the habits and life-history of the insects will contribute to their control. Other drawbacks are the high winds that are prevalent during the winter or rainy season. These high winds often cause loss or serious injury to vegetables and annual crops, but are not considered serious in relation to the cultivation of perennials. As in new countries a number of settlers living together as a community will do better than the same people in isolated locations. Whatever drawbacks there may be, those now living in the Islands have faith that they are such as can be easily overcome.—*Jared Smith in "Agricultural Possibilities in Hawaii."*

FARMERS' INSTITUTE MEETING.

At the meeting of the Farmers' Institute on May 12th at the Library of the Board of Agriculture and Forestry, the following papers were presented:

Co-operative Fruit Marketing by Mr. John Emmeluth.

The Necessity of Growing More Fruit in Hawaii by Mr. Weinrich.

An account of the transaction of the meeting will be given in the June Forester.

BY AUTHORITY.

Notice is hereby given that MR. GERRIT P. WILDER has been appointed a member of the Board of Agriculture and Forestry for the Territory of Hawaii.

G. R. CARTER,
Governor.

Executive Building, Honolulu, Jan. 5, 1906.

Notice is hereby given that Mr. Christian C. Conradt has been appointed a District Fire Warden under the Board of Agriculture and Forestry, for that section of Molokai extending from the land of Pukoo to the land of Halawa, inclusive.

C. S. HOLLOWAY,
Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., January 11, 1906.

Notice is hereby given that Mr. Robert Ray Elgin has been appointed an Honorary Inspector in the Entomological Division of the Board of Agriculture and Forestry for the port of Mahukona.

C. S. HOLLOWAY,
Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., January 11, 1906.

Notice is hereby given that Dr. Harold B. Elliot has been appointed Assistant Veterinary Inspector, under the Board of Agriculture and Forestry, for the port of Hilo.

C. S. HOLLOWAY,
Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., January 12, 1906.

BRUSH FIRES ON TANTALUS.

Notice is hereby given that in accordance with Section 6 of Act 71 of the Session Laws of 1905 it is forbidden to start fires for the burning of brush, dry grass, etc., for a period of twelve months (12) from date, within that portion of the District of Kona, Island of Oahu, lying between Manoa and Pauoa Valleys, unless the written permission of the District Fire Warden has been first obtained. The law reads "such fires shall not be started during a heavy wind or without sufficient help present to control the same, and the fire shall be watched by the person setting

the same, or by competent agents of his, until put out." The Fire Warden is Mr. Walter M. Giffard.

RALPH S. HOSMER,
Chief Fire Warden.

Honolulu, T. H., Feb. 8, 1906.

Notice is hereby given that in accordance with the terms of Act 71 of the Session Laws of 1905,

MR. WALTER M. GIFFARD

has been appointed District Fire Warden, under the Board of Agriculture and Forestry for that portion of the District of Kona, Island of Oahu, lying between Manoa and Pauoa Valleys.

C. S. HOLLOWAY,

Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., Feb. 8, 1906.

Notice is hereby given that Mr. Thomas S. Kay has been appointed District Forester for the District of North Kohala and that portion of the District of Hamakua, lying between said District of North Kohala and Waimanu Valley, Island of Hawaii, under the Board of Agriculture and Forestry, in accordance with Chapter 28 of the Revised Laws.

C. S. HOLLOWAY,

Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., Feb. 27th, 1906.

Notice is hereby given that Mr. David Kapihi has been appointed Forest Ranger, under the provisions of Chapter 28 of the Revised Laws, for that section of the District of Kona, Island of Oahu, bounded on the East by Manoa Valley, on the North by the Konahuanui Mountain Range, on the West by Pauoa Valley, and on the South by the makai edge of the Eucalyptus forest, the Makiki reservoir and the foot of Round Top, as far as the mauka boundary of the Judd land in Manoa and Makiki.

C. S. HOLLOWAY,

Secretary Board of Agriculture and Forestry.

Honolulu, T. H., March 6, 1906.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Shower, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haugh, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.
Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.
First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and E. M. Newell. Circular No. 2; 4 pp., cut; 1905.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 8 pp.; 1905.

"Suggestions in Regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1905.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

"Out of Print.

Any one or all of the publications listed above (except those marked *) will be sent to residents of this Territory, free, upon application to Mailing Clerk
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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. II.

JUNE, 1906

No. 6

The cultivation of pineapples on these Islands as a commercial venture, has probably been in progress for a period of about fifteen years. The last five years have seen a very great development of the acreage under cultivation for this purpose, and indications point to the fact that the next few years will witness an even greater extension of the industry.

The difficulties which face Hawaiian growers of agricultural products destined for disposal on the Mainland are unusual and are chiefly attendant upon the vast distance of their market, and also upon the remoteness of many of the plantations from rail and wharf.

Hitherto the method of marketing Hawaiian pineapples, and in fact the system which is in use today, is for each individual grower to consign his produce to some Mainland agent to be sold there upon commission. The result of this is to bring each consigner into direct competition in the Coast market with his fellow-growers, with the effect that prices are at times depreciated below the actual cost of production, and in some cases have fallen so low as not even to be sufficient to defray excessive freight charges.

Not less disastrous to the realization of a profitable return is it that at times the simultaneous arrival of large shipments of fruit from different producers has so overstocked the market that a large proportion of it has been unable to be disposed of at any price, and has thus become an entire loss. After such a "glut" a period has often followed when a Hawaiian pineapple was unprocurable upon the Mainland, and could the shipments have been arranged to arrive at different times, good prices would have been secured for all.

With the increased output of pineapples for this Territory which is now anticipated, the difficulties facing the growers will be greatly accentuated, and it is believed by earnest observers that the success and the existence of many of the plantations depends upon immediate provision being made to obtain more

favorable marketing facilities. The condition of affairs is deemed urgent and unless steps are taken to ameliorate the situation it will become crucial upon the maturity of the present season's crop.

The quantity of Hawaiian pineapples disposed of in Mainland markets till now has been small compared with that received from Singapore, the West Indies, Florida and other countries.

Island pineapples have, as a rule, only been sold in certain of the most accessible Western cities, but as soon as their merits are popularly known, and when a proper distributing system is in operation they should easily displace all competition, for in flavor, uniformity, color and general appearance they are superior to all others. With these preponderating qualities it is believed that a ready market will be found for the entire output of our Hawaiian fruit as soon as the markets can be properly reached, for indications show that as yet the general American markets are untouched by our produce.

Hitherto the island growers have been unable to effect an organization to safeguard their interests, although in past years attempts have been made to unite them. However, the time is now opportune and circumstances demand that if the industry is to be established upon a profitable basis, a coöperation must be formed upon lines similar to those under which the fruit growers of California are so successfully organized. While the system in beneficial operation in California has become in the course of a few years very far-reaching and to some extent complex, it is uncertain that such an elaborately conducted plan could at first be adopted by the Hawaiian growers. With as many interests involved as growers represented, it would probably be some time before that mutual confidence, which is the keynote of success in such an undertaking, could be developed. The merging of all spirit of rivalry and jealousy into one uniform and equitable policy embracing the good of the whole must be appreciated and fostered before the full utility of the coöperation could be developed.

It therefore would seem expedient to endeavor to ascertain a common ground upon which all our Hawaiian pineapple growers would unite for the common good. With an agreement in operation between them, formulated upon even one point of interest, it would not be long before the accruing benefits were such that the agreement would be widened until it embraced as successful a field of enterprise as that covered by the well known Californian organization.

As in every other industry the present position of agriculture has been attained only by patient and continual effort, and each success has been possible only by the accumulated experience of the past. The success of agriculture today is, however, chiefly due to the availability of only a part of the record for, as a general rule, it has only been the result of successful experiment which has been preserved. It is to be regretted that as extensive and comprehensive an account of past failures and only partial successes of experimenters is not available. Were such knowledge disseminated we should be in a position to weigh the possibilities and probabilities of the success of new undertakings under the enlightenment of the whole record and should not so often see the same blunders perpetuated and the same impossibilities attempted by each generation of agriculturists. We would therefore urge the same patient observance and the same perseverance to record cases of failure as has hitherto been given to those of success. In examining the causes of failure and endeavoring to overcome them, the road to success may generally be determined. It is, however, of the utmost importance that the whole of the attendant circumstances of failure be critically viewed, for, if this be not done with intelligence and exactness, the bare record of a failure is calculated to have a far greater and more harmful effect than if the result of the experiment had been allowed to go unnoticed. Man is too prone to be influenced by discouraging statements, and too often in the past the sweeping announcement of the impossibility of attempting certain lines of agriculture has been sufficient to deter their attempt for many decades. Very often such gratuitous dicta are founded upon single experiments conducted by individuals unlearned in the first essentials of agriculture and under such conditions that signal failure was assured. The cultivation of many valuable plants is today pronounced impossible in Hawaii, and many such cases will occur to all our readers. For our own part we believe emphatically that there are very few fruit or flower producing plants of economic importance which cannot be grown as successfully in Hawaii as elsewhere. In every attempt at growing a plant exotic to these islands the first essential is the selection of a suitable habitat with regard to such provision as altitude, rainfall, atmospheric humidity, and soil constituents, and in none of the hitherto recorded failures, which has been brought to our notice, has due respect been paid to all of these. The plants,

which have chiefly been maligned in this respect, are to be found among fruit trees and garden flowers. If a list of the plants, whose cultivation is believed to be impossible in these islands, were submitted to the Hawaii Experiment Station, we have no doubt that fully three-fourths could be freed for the ban which has been thoughtlessly placed upon them.

The display in the windows of the Hawaii Promotion Committee's Hotel street offices affords a conclusive object lesson of the superior advantages of our island products. Mr. Weinrich shows, side by side, specimens of the Hawaiian and the Guatemala sisal plants, and also a selected series of samples of the ropes and cordage made from this useful fibre material. In view of the success which has been achieved by the sisal plantation of which Mr. Weinrich is manager, and of the excellence of the fibre which is produced there, it is a matter of surprise that more similar plantations have not been established in the islands.

We are glad to be able to recontinue the admirable series of Agricultural Notes which was discontinued some numbers ago upon the departure of Mr. Jared Smith to the Mainland. The wide experience of the Director of the Hawaii Agricultural Station has enabled the Forester to publish a valuable selection of statistics and information upon varied agricultural industries, which would otherwise be inaccessible to the majority of its readers.

RUBBER NOTES.

"Unfortunately I have only five acres of rubber yielding at present. I get about \$100 per acre a month profit from them."—*Correspondent in the Ceylon Observer.*

Artificial rubber is no nearer in sight than ten years ago, and seems as remote as artificial gold; but if it should be achieved, chemical rubber would probably be of a low-grade or would cost more than plantation rubber. However, the fall from present prices is not likely to come very soon. One of the largest American importers of rubber has a man in Ceylon now trying to write contracts with rubber plantations there to take their entire output for the next ten years at one dollar per pound, but it is not believed that he is doing much business. The present outlook is that the planters can do better than that.—*Ceylon Tropical Agriculturist.*

FARMERS' INSTITUTE MEETING.

An interesting and profitable Institute meeting was held at the library of the Board of Agriculture and Forestry building, Honolulu, Saturday evening, May 12th. There was a good attendance, and many prominent growers from other islands were noted.

The important subject of coöperative marketing of Hawaiian agricultural products was taken up with enthusiasm, and it is believed some good results must follow.

President Jared G. Smith, in his introduction, read an outline of the organization of the California Fruit Distributors, which is composed of growers, shippers and coöperative associations engaged in the deciduous fruit business.

The committee on coöperative marketing, consisting of Byron O. Clark, chairman; John Emmeluth, James D. Dole, R. H. Trent and Mr. Eames, then presented the following report:

"The practice of growers consigning produce to dealers, to be placed on sale in competition with each other, without any restriction as to minimum price for which the produce shall be sold, is unnecessary and ruinous and should be discontinued.

"We believe coöperative marketing along the lines now in operation among California fruit growers can be made a success for Hawaiian growers at any time that they may agree so to do, but we find they are slow to avail themselves of the remedy; until such time as a coöperative plan of marketing may be perfected, we recommend that the individual shippers establish a minimum price for their produce f. o. b. Honolulu, or Coast distributing point, and refuse to consign any fruit for sale on commission. This will enable the individual to establish a schedule of prices yielding a margin of profit, and your committee believes will be a step towards coöperative marketing, which will be realized in the near future."

In offering this report, Mr. Clark said that it was only signed by two members of the committee, but he believed that it would have been approved by a third if the committee could have been gotten together. It was or seemed impossible to get all the committee of five to meet.

The report met with very general approval, and was supplemented by the reading by Jared Smith of an extract from the

Pacific Rural Press consisting of an article by Alden Anderson, Lieutenant-Governor of California, descriptive of the aims and purposes of the California Fruit Distributors, which is a kind of clearing house for deciduous fruit growers in California which enables the producers themselves to control their market.

General discussion, approving coöperation and the reaching out for a market, followed, the end being that a motion carried that the report of the committee be adopted, and the committee of five retained with orders to endeavor to effect a combination to control the market for the growers in time to make profit of the next year's crop of pineapples. The organization of these is expected to be followed by organization and coöperation along broader lines, so that in time the island growers of tropical and sub-tropical products will reach and regulate the immense Mainland markets which, as yet, have hardly been touched for both fresh and prepared fruit products.

After the discussion, it was made known that J. E. Higgins will go to the Mainland within the next few weeks to study market conditions with reference to pineapples and bananas particularly, to find out why fruit shipped does not arrive in good order, to see whether prices cannot be improved, and to make the experiment of shipping a carload of bananas, pineapples, alligator pears and mangoes from San Francisco straight through to New York.

The following paper was read by Mr. John Emmeluth:

CO-OPERATIVE MARKETING.

The various agricultural enterprises in these Islands are confronted by market conditions, both as to purchase of supplies and the disposition of their crops—practically unknown on the Mainland.

Twenty-one hundred miles distance by water lies between the local port of entry and the nearest Mainland port with which we can exchange commodities.

Add to this the untoward local conditions confronting the majority of agriculturists in getting supplies to their several holdings or their output to the most convenient port of shipment and you have before you the initial cause of the individual grower's lament.

Couple with these factors the constantly varying prices for supplies required in preparing the crop for market on the one

hand, and fluctuation in returns on shipments of goods marketed, caused in part by claims for loss on over-ripe or under-sized fruit, poor packing, or overheating en route, forced sale on account of a glut in the market through overshipments and finally inability to enforce prompt settlements after sales are made and you write the seamy experiences of nine out of every ten agriculturists in this Territory.

Much of the disappointment touched upon in the last paragraph is the direct result of unorganized individual effort, ignorance of market conditions and of the parties to whom products are consigned for sale, with the immediate consequences that advantage is taken of the absence of supervision in the interest of the grower and resulting in the paring down of account sales for causes already noted.

Such experiences as these and the rapid increase in output should point the necessity of individual growers getting together on some basis of joint action in order to avoid the inevitable results of procrastination.

It is highly essential to the success of any joint effort that those associating themselves should do so for the common good.

Men cannot coöperate successfully if the sole bond between them is self-interest.

Effort should be made to operate for the general welfare in the purchase and distribution of the necessary supplies, in securing equitable carrier rates both local and to the mainland, to secure better service by guaranteeing to carriers a stipulated amount of freight in consideration of proper provision for its storage and care in transit; to secure the services of a competent man to look after the care and distribution of fruit at the mainland port; report condition of goods on arrival; pass on all claims for deductions and to adopt such means for the extension of the market as may be approved from time to time by the association.

The expense of such a man would be saved every month in commissions on purchases and increased returns on consignments consequent on his personal supervision of shipments and collections. While these would be among the immediate advantages the more permanent results of his efforts would be found in the extension of business connections and preparedness for marketing a constantly increasing quantity of fresh fruit; this work would be done at intervals between arrival of consignments.

Attached hereto is a tabulation of imports of bananas and pine-

apples into the United States for the three years immediately preceding July 1, 1905. While these figures loom up big as compared with our present output, yet they show a consumption of only one bunch of bananas per year for every three of the population and an even smaller consumption of pineapples, and such pineapples averaging ten to the cubic foot.

While these figures indicate that there is room at the top for all the fruit this Territory can raise in the next twenty years, wise counsels must prevail and the market possibilities be exploited with the same earnestness and enthusiasm as is being evinced in the present extension of acreage in fruit.

No enterprise can be made successful when handicapped with excessive and discriminating carrier's charges. Sugar carried from mill to port at three cents per ton per mile of haul, while fruit pays from four to six times this amount for the same service, is a condition to which individual effort is powerless to apply the remedy.

We have now had about six years of Uncle Sam's influence in these Islands, but there are still wharves and landings where notices informing you that "foods, wares and merchandise can be landed only upon payment of the wharfage fees" to some corporation, are prominently displayed.

Concerted action is necessary in dealing with problems of the kind hereinabove alluded to.

Coöperation is needed to secure favorable legislative action on the matter of establishing an agricultural college, to urge such modification of the present school system as will tend to turn the minds and hands of the rising generation to the arts of the husbandman, to urge the extension of the exemption of certain products of industry and making such exemption permanent and to secure the passage of a law and the necessary appropriation for creating a territorial bureau of industrial statistics.

U. S. importations of bananas and pineapples for the years 1903-04-05:

BANANAS.

	Bunches.	Value.	Per Bunch.
1903	20,711,301	\$8,534,769	.287
1904	25,757,236	7,748,111	.301
1905	38,093,863	9,882,612	.259

PINEAPPLES.

1903.

	Number.	Value.	Each.
.	20,729,940	\$559,125.00	.027
.	2,750,000	75,280.00	.02757
Total	23,479,940	\$634,405.00	

1904.

.	2,017,530	\$ 57,969.00	.0287
.	15,900,210	591,532.00	.0372
.	3,104,000	82,123.77	.02646
.	6	.18	.03
Total	21,021,746	\$731,624.89	

1905.

.	118,860	\$ 3,904.00	.0329
.	23,250,110	777,846.00	.0335
.	2,138,000	58,386.00	.02729
.	280	17.62	.06293
Total	25,507,250	\$840,153.62	

er the reading of a paper by Mr. Weinrich, in which was
ated the more extensive and varied growing of fruits in
iii, the meeting adjourned.

AVOCADO PEAR NOTES.

ough few varieties of the Palta have been described, the
sity of form is very great. In general this diversity seems
low geographical lines, the forms of any particular region
more or less closely related. A very distinct type, with
hard skin, is found in Guatemala, which promises to sur-
in shipping qualities the better known forms.

ung plants may readily be propagated from seed, and bud-
and grafting can be accomplished, the former method being
nmon use in Florida.

anything like the presnt prices can be maintained, the
ng of avocados of good shipping variety ought to become
remunerative industry.

THE SILO IN AUSTRALIA.

The following information is obtained from an article by Mr. T. Cherry, in the April number of the *Journal of Agriculture of Victoria*. It is reprinted here in view of the great interest that is now being taken in Hawaii in the conservation of farm food-stuffs as a protection against drought:

The use of the silo is gradually coming into favor all over the State, and at Nhill several have been built and filled this season, principally with oats, barley, or native grass. The object is to provide succulent food for lambing ewes, just when all the grass is dry. Mr. Dahlenberg has opened and fed a good part of the contents of his silo to cows, and is highly pleased with the results.



CONSTRUCTING AN ENSILAGE STACK.

so much so that he has decided to build several more. Mr. Edwards showed me some of his silage, which, though rather dark in color, is very sweet and good. Owing to a good rainfall he will not require to use it this season. An impression is prevalent that if silage is not used the season it is made it will be no good, but this is a mistake. Provided the air is kept away, it will keep good for practically any length of time. Mr. Bond, an older settler in the Nhill district, has been handling silage for ten or eleven years, and when he has not required all the silage in a pit or silo he has filled up again, and that which was left over was quite good when he came to use it another year. Mr. Robinson, of Warracknabeal, told me he has proved the same thing. He won a gold medal, given by Messrs. Cuming, Smith and Company, for the best silage. The silage was not required for feeding at

the time, and he was advised not to open it, but he did, and obtained the medal, then closed it up again until the following season, when it turned out as good as before.

One mistake I notice in filling several of the silos is that the stuff has drawn away from the sides, so letting the air down between the silage and silo, in which case there is considerable waste. This is due to the fact that the middle is kept too full, and the sides not full enough, nor yet trampled enough. The weight of the silage from the elevator continually falling in the middle is almost sufficient to insure consolidation at that part, and the outside should be kept at least three feet higher than the middle, and well trampled. I also feel sure that it would pay to have planks cut the shape of the silo to lay on the top to exclude the air, and on the top of these planks to place weights, either in the shape of posts, sleepers, bags of sand, or whatever is easiest to handle.



SILOS ON FARM, IN AUSTRALIA.

Another mistake is sometimes made in making the silo too great in diameter. This should be proportionate to the number of animals to be fed. King gives the following table as furnishing the best guide as to the diameter of silo, which insures sufficient being removed from the surface daily to prevent any going bad:

	Feeding Surface.	Inside Diameter.
30 cows	150 square feet	14 feet
40 cows	200 square feet	16 feet
50 cows	250 square feet	18 feet
60 cows	300 square feet	19¾ feet
70 cows	350 square feet	21¼ feet
80 cows	400 square feet	22¾ feet
90 cows	450 square feet	24 feet
100 cows	500 square feet.	25¼ feet

I have not met any one yet who has tried silage and is not thoroughly satisfied with the result.

PERSONALIA.

Mr. Ralph Hosmer is at present on the Mainland and is expected to return to Honolulu towards the end of July, after an absence of two months.

Mr. F. G. Krauss, Agriculturist of Kamehameha Schools, is relinquishing the work which he has carried on with great success, in order to undertake a series of experiments for the Federal Government in the development of an improved strain of rice for use in these islands.

We are in receipt of a report upon the sugar industry of Peru by Mr. Thomas F. Sedgwick, late manager of the Hacienda Cartavio of that country. Mr. Sedgwick has been engaged for two and a half years in the cultivation of sugar in Peru, and the report furnishes a general idea of the conditions there, and also gives comprehensive data of the Hacienda Cartavio. The conditions in Peru are most favorable to sugar cane growing and to a high production of sugar. The greatest needs of the industry there are the development of water supply and the introduction of modern milling methods and machinery. The report, which is illustrated, consists of seventy-eight pages, bound in cloth and is, so far as can be learned, the first publication printed in English in the city of Trujillo, Peru. The minor textual errors, which have crept into the book, can be readily pardoned when it is remembered that the printers worked in a language with which they were unacquainted. The Peruvian Government has now secured Mr. Sedgwick's services to organize and direct an experiment station for sugar at Lima.

GRAPES.

Grapes are widely grown in the islands, especially by the Portuguese settlers. The principal variety is the Isabella, but European wine and table grapes also thrive. Some wine is made by the local growers. This is sold in the local market. It is of the Madeira type. There are good openings for vineyardists either in the production of wine or in growing table grapes for the Mainland market, as it is entirely feasible to make the vines bear at any season of the year. There is hardly any month when the Isabella grape is not offered for sale in the Honolulu market. There is a big opportunity for some one to come here to Hawaii and grow table grapes for shipment to the Mainland during the period from December to June.—*Jared Smith.*

AGRICULTURAL JOURNALS.

ARTICLES OF IMPORTANCE TO HAWAII IN THE CURRENT MAGAZINES.

The Tropical Agriculturist, Magazine of the Ceylon Agricultural Society, March, 1906.

The World's Rubber.

Banana Flour, by C. Drieberg.

The Avocado: A Salad Fruit from the Tropics, Part II.

The Cultivation of the Grape Vine in Ceylon, by D. F. De Silva Gunaratne.

The Mangosteen.

The Journal of the Department of Agriculture of Victoria, April, 1906.

Summer Pruning, by C. B. Luffmann, Principal School of Horticulture & Small Farming, Burnley.

Garden Notes: The Phlox, by J. Cronin, Inspector Vegetation Diseases Acts.

Agricultural High Schools.

Ducks for Export, by A. Hart, Poultry Expert.

The Lessons of a Dry Summer, by T. Cherry, M. D., M. S.

The Agricultural Gazette of New South Wales, April, 1906.

Uses of New South Wales Timbers, by J. H. Maiden.

Hawkesbury Agricultural College and Experimental Farm. Stack Ensilage, by W. H. Potts.

Sheep at Wagga Experiment Farm, by G. M. McKeown.

Farmers' Fowls, Faverolles, by G. Bradshaw.

Bulletin of the Department of Agriculture, Kingston, Jamaica.

Cultivation and Marketing of Citrus Fruits, by H. Q. Levy.

THE MANGO.

The mango is a delicious fruit, almost unknown on the Mainland. There are some forty or fifty varieties in Hawaii. The tree requires rich soil and a medium amount of irrigation. It can be propagated from seed, in which case there is no surety that it will come true to seed and, also, by grafting, budding and inarching. The fruit ships well in cold storage, retaining its flavor and ripening its color, as well as do the deciduous fruits packed and shipped under similar conditions. The Mainland market is capable of development and will undoubtedly in time absorb large quantities of this king of tropical fruits.—Jared Smith.

NOTES ON THE CARE OF PIGS.

From the Journal of the Jamaica Agricultural Society.

Imported Breeds.—The Poland China, Berkshire and Tamworth are all profitable types of pigs, and if crossed with our native sows, will produce pigs that will mature early and scale 150 pounds and upwards at six months old.

Breeding Sows.—A breeding sow should drop two litters a year, the gestation period is four months, and her young pigs should be weaned at six to eight weeks old. She should not be closely confined. Shortly before dropping she may be penned, her young being allowed to run in and out as they like. While suckling her young she must be liberally fed three times a day and not be allowed to run down in condition.

Young Pigs.—Growing pigs should be kept healthy and fat. At the time of weaning they must receive suitable feed, such as middlings or skim milk to keep them from falling off in condition.

Fat Pigs.—Pigs should be fattened and fit for the butcher at six months old. The improved breeds should weigh at least 150 pounds at six months, and one pound per day should be the minimum gain up to one year old.

Feeds and Feeding.—Experiments in other countries have established the fact that 4 pounds of corn ground and soaked in water will produce 1 pound of pork; but 4 pounds of corn fed with skim milk in proportion of 3 quarts to 1 pound of corn, will produce $2\frac{1}{2}$ pounds of pork.

Imported Meals.—The high price of imported meal and corn will not allow of its being profitably fed to pigs except to a small extent, and then only in conjunction with other feeds. Breeding sows while suckling their young should receive 1 to 2 pounds daily in addition to other feeding if it is found they are falling off in condition.

Salt and Charcoal.—Salt should always be sprinkled over pigs' food, and if they are kept in close confinement a handful of charcoal should occasionally be thrown in the food. A pig should be fed at least twice a day all it can eat up clean.

Green Food.—A pig in confinement must be given some Guinea grass or other green food daily.

Water.—All pigs require pure water to drink and should have access to it at all times. It is not necessary as many people suppose that the pig in confinement should have a mud pool to wallow in.

Bananas.—Bananas, which are one of the staple feeds in Jamaica, can be fed in various ways. Ripe bananas produce the best results, green bananas should be boiled with salt and fed cold. Admirable results have been obtained with green bananas treated as follows: Strip off the fingers and throw into barrels, cover over to exclude the air and leave to ferment, when the fruit is reduced to a pulp bale out the solid mass and feed to the pigs, the vinegar can be stored and ripened for domestic use.

Styes and Pens.—The man who keeps pigs in a filthy sty should be prosecuted; insanitary quarters breed disease. A large run is not necessary for fattening pigs, but if confined in a small space they must be kept dry and clean. A concrete floor is perhaps best, but boards raised a little off the ground do equally well, and when the ground underneath gets foul they can be removed to a fresh place. Above all, proper provision must be made for a sleeping place affording ample protection from rain. For fattening pigs in larger quantities, select an old building (if you have one) and make the roof water-tight, so that the pigs are sure of a dry bed in all weathers; adjoining it fence in two runs sufficiently large to give the pigs plenty of room to root, when the ground in one begins to get foul change to the other.

Lime.—Always disinfect with lime all foul pens after clearing away the manure.

A. H. PINNOCK.

Lyndhurst, St. Andrew.

GARDEN VEGETABLES.

The production of garden vegetables for the market is almost entirely in the hands of Chinese, but products of better qualities than the ordinary varieties commonly grown by these people, find good sale at fair prices. Conditions are such that any settler can grow almost any class of garden vegetables, excepting celery, peas and cauliflower, in his own garden at all seasons of the year. Insect pests and plant diseases are as abundant in Hawaii as anywhere else, but here, as elsewhere, yield readily to the application of scientific remedies. There are good openings in the islands for people who wish to undertake the cultivation of the better class of garden products. Cabbages, peas, sweet and Irish potatoes, green corn, lettuce, parsley, tomatoes and many others grow as well here as anywhere else. Vegetables of the melon and squash types are subject to damage by a fruit-fly, which stings the young fruit and causes it to rot or drop off. Excellent celery and cauliflower are grown at elevations above 3000 feet. Green corn is in the Honolulu market the year round.—*Jared Smith.*

MISCELLANEOUS NOTES.

BY JARED SMITH, *Special Agent in Charge, Hawaii Experiment Station.*

It is claimed by Indian planters that there is a difference in the quality of rubber produced by young and mature *Hevea* trees. Rubber from 5-year-old trees does not command more than 80 cents per pound while that from trees 8 or more years old, sells for as high as \$1.50.

Indian Planting and Gardening states that in Ceylon a 300-acre rubber plantation 8 years old, which had cost \$36,000 for labor and all expenses of management, produced in one year rubber valued at \$91,300. The trees were *Heveas*, planted 200 to the acre. This is a doubtful statement, probable untrue, because only \$140,000 worth of rubber was exported from Ceylon in 1905.

Mr. Ridley, Director of the Singapore Botanic Gardens, has the following to say in regard to rubber prospects:

"The area in which rubber has been produced is almost exhausted of the product, and a large part of that area, (the greater part of Africa,) is utterly unsuited for the cultivation of any rubber plant of any value. The *Landolphias* of Africa are quite unsuited for cultivation and are never likely to come into competition with the cultivated *Hevea* and *Ficus*. Over the large area which produced these rubbers and which is now nearly exhausted of its stock, there is little or no ground suited to the cultivation of those rubbers which are possible of remunerative cultivation. The volume of rubber produced by this area must therefore be supplied by the increasing area of cultivation in the Malay Peninsula, Ceylon and a few other parts of the world. Mexico and Northern Brazil may perhaps be able to supply *Castilloa* and *Hevea* rubber in sufficient amount to replace the denuded forests of the Amazons. But in the meantime the demand is increasing and it will be long before the product can possibly be produced in sufficient quantity to fill even the present demand. Rubber then is almost the ideal cultivation for the planter. Rubber is in fact the only product known to me, which, while it has an universal use, has so limited an area of production, and it is also unique in having practically disappeared from a large area which

supplied a considerable proportion of the world's crop, and in which it never can be replaced. *Under these exceptional circumstances it does not seem probable that this product is likely to be overproduced for very many years, if ever at all.*"—*Agric. Bul. Straits and Fed. Malay States.*

Indian and Ceylon Tea Growers have contributed \$60,000 jointly for the purpose of advertising their product in the United States during 1906. In addition the Indian growers have contributed \$25,000 for the same purpose.

The Florists' Exchange reports the following remedy for red spider: Spray the plants with a weak solution of glue. This kills the spiders, but not the eggs. A weak mixture of boiled flour paste and whale oil soap in water kills both adults and eggs, and a tobacco solution added is effective against other soft-bodied insects. This soap-starch-nicotine mixture is said to be an active remedy for mealy bugs.

One very important point in the control of the melon fly is to pick up and destroy all infected fruit. This applies to tomatoes, green beans, egg plants, melons, gourds and squashes. Destroy the infested fruit.

The world's consumption of jute has risen from 2,260,000 bales in 1894 to 8,800,000 bales in 1904. India is the sole source of supply because of climatic conditions and the cheapness of labor.

Remedies for sore-head of chickens, recommended by the Natal Department of Agriculture, are the following: A 4 per cent. solution of nitrate of silver; or, an ointment of 5 per cent. nitrate of silver in lard. Also an ointment composed of red oxide of mercury 1 part, lard 8 parts. To keep sore-head in check not only treat the birds but cleanse the houses and roosts with boiling hot water and spray with Bordeaux mixture.

The Government of Brazil has decreed a prize of \$10,000 for any one who exhibits a plantation of 100,000 Ceara rubber trees within 18 months from December, 1905. Other prizes are for \$5,000, \$3,400 and \$1,600 for the next largest plantations, the smallest of which in order to gain a prize must be not less than 20,000 trees.

Sixty-five tons of rubber were exported from Ceylon in 1905. The acreage planted to rubber now amounts to 45,000 acres in Ceylon, and about 67,000 acres in Malay, Indian Burmah, Java and Sumatra. Clean, dry biscuit and sheet rubber now commands a premium of 20 to 24 cents per pound over fine Para.

Four million seven hundred twenty-two thousand and eight hundred bunches of bananas were imported into England in 1905. Three million two hundred and sixty-three bunches were received from Jamaica and Costa Rica, an increase of 1,400,000 bunches over 1904.

An organization known as the "Liverpool Institute of Commercial Research in the Tropics" has recently been established for the purpose of protecting and increasing the present supply of rubber; to examine possible new sources of vegetable oils; to investigate the pests and diseases affecting certain tropical crops; and to investigate new fibres and extend the cultivation of fibre plants. An expedition has been sent to the West Coast of Africa by this institute.

In an "egg-laying contest," recently held in England, under the auspices of the "Utility Poultry Club," 144 pullets laid 5401 eggs in 16 weeks, from October to January. The judges gave two points for each egg weighing $1\frac{3}{4}$ oz. or over, and 1 point for each egg under this weight. The birds of each variety in the competition were divided into pens of 12 birds. The first prize went to White Leghorns with individual scores of from 61 to 66 eggs and 500 for points, only 2 eggs out of 251 laid by 4 birds in the winning pen being under $1\frac{3}{4}$ ounces in weight. Buff Orpingtons won the second and third prizes with individual scores of 39 to 75 eggs and pen records of 468 and 441 points. The feeding was generous, amounting to 4 ounces of dry food per bird per day for 10 weeks and 3 ounces for the remaining 6 weeks. The mash consisted of equal parts of chopped green food, meat or green bone, and meal, the latter a mixture of ground barley, midlings, pea-meal and linseed meal. A scanty feed of wheat was given at noon, and a liberal feed at night of wheat, oats and barley. No corn was given in any shape. Water and grit were constantly supplied. The birds received an occasional dose of salt, but no spices or condiments.

ENTOMOLOGICAL NOTES.

(From the Division of Entomology, Board of Agriculture and Forestry, by JACOB KOTINSKY.)

A Press Bulletin (No. 59) of the Florida Agricultural Experiment Station, recently received, is of some interest to this Territory and attention is therefore called to its contents. The "Manatee Snail" (*Bulimulus dormani*) is the subject and Dr. E. H. Sellards, the author. The snail in question has been found feeding extensively upon the black sooty fungus on citrus trees affected with scale, mealy bugs and white fly. As is well known this fungus is not parasitic and results from the deposits of honey dew made by the various bugs upon which it thrives. If injurious at all it is only perhaps because it excludes the light from the leaves it covers. It does, however, make an affected plant look unsightly, and where fruit is grown for the market washing becomes necessary, which entails an expense. For the past two years, Dr. Sellards tells us, this snail has been observed in Florida feeding ravenously upon this sooty mold thus giving the trees they inhabit a clean, healthy appearance. It seems to be a rapid breeder, as a colony is known to have cleaned an orchard of sooty mold in course of a few months. Colonies are easily transferred from place to place and efforts are now being made to establish the snail all over Florida. It has not been observed to feed upon any of the beneficial fungi attacking bugs in the orange districts of that state. In view of the periodical infestation of our avocado pear, citrus and banyan and other trees by this mold, as a result of the presence of the so-called pear blight or avocado pear scale (*Pseudococcus nipae*), it may not be inadvisable for this Territory to consider the advisability of introducing the snail.

SOME INSECT ENEMIES OF POULTRY.

Through the courtesy of Mr. Gerrit P. Wilder the author was privileged to examine and identify several insect parasites affecting the domestic fowls; Mr. Wilder having collected these in quantity and brought to us for study.

Large Chicken Louse (*Goniocotes abdominalis*, Piaget).

In Bulletin No. 5, N. S., Division Entomology, U. S. Department of Agriculture, this species is characterized as follows:

"It is a large conspicuous species about 3 mm. ($\frac{1}{8}$ of an inch) in length, quite broad, the head nearly circular in front and constricted behind; the thorax small the abdomen widening to near the end and terminating abruptly. The head, thorax and legs are yellowish with dark margins and spots; the abdominal segments bear lateral whitish fascia bordered with black."

Numerous specimens on chicken feathers collected by Mr. G. P. Wilder in Honolulu.

The Variable Chicken Louse (*Lipeurus variabilis*, Nitzsch.)

The description in op. c. is as follows: "It is about 2 mm. (1-12 of an inch) in length, the body elongated of a whitish color and smooth and shining. The margins of the body are black: the head is large, rounded on the anterior margins and the whole appearance sufficiently distinct from any of the species infesting chickens, so that there can be no difficulty in distinguishing it at a glance."

Numerous on chicken feathers collected by Mr. G. P. Wilder in Honolulu.

The Pigeon Lipeurus (*Lepcurus baculus*, Nitzsch).

Following is the description in the above cited work: "It is about 2 mm. (1-12 of an inch) in length, the body very slender; the head and thorax are of a bright reddish brown color, while the abdomen is rather dusky with a series of patches of a brown color corresponding with the segments of the abdomen. So far as known this species is confined to pigeons and there seems no danger of their being transmitted to other fowls with which they may associate."

One specimen on pigeon feathers collected by Mr. G. P. Wilder in Honolulu.

A CHICKEN FEATHER MITE.

Immense numbers of this mite were collected by Mr. G. P. Wilder on the chicken feathers and brought to this office for study. Its identity has not as yet been ascertained but it is doubtless one of the common poultry pests.

REMEDIES:

The most comprehensive advice for keeping poultry free from parasites is cleanliness. A hen house frequently swept and white-

washed and once or twice a year thoroughly sprayed with kerosene emulsion and the hens dusted with pyrethrum powder or buhach and finally careful inspection and quarantine of new additions to the flock will keep the fowls free from these pests. An old hen house well stocked with parasites is best burned and replaced by a new one. A house in good condition, if found infested, should be thoroughly sprayed with kerosene emulsion several times at intervals of about 10 days, treating the fowls in the mean time to a dusting of pyrethrum powder. Ordinary road dust, by the way, is good insecticide in itself and the hen that sits down in the dust and scatters it over her back is doing it for relief from annoying parasites. It should be the business, therefore, of every chicken grower to provide his stock with means of getting a good dust bath. As probably none of the poultry houses on these Islands can be made air-tight without much trouble and expense the question of fumigating them need not be considered.

ENTOMOLOGICAL INSPECTION REPORT.

May 16th, 1906.

To the Honorable Board of Agriculture and Forestry of Hawaii.

Gentlemen:—Since my last report, dated March 7th, I have the following statement to submit to you:

Eighty-four (84) steam and sailing vessels from outside this Territory have entered the port of Honolulu and brought eighteen thousand nine hundred and forty-five (18,945) packages of fruits and vegetables as freight. One hundred and eighty (180) parcels and packages by Wells, Fargo Express and Mail and eighteen (18) loose lots of plants by passengers.

Among the plants by freight from Japan were five (5) tea bushes that were seriously infested with the partial "mining" scale *Pseudaonidia paeoniæ*. This pest also attacks orange, camellia and a number of other plants. In the same case was a plant of *Lespedeza bicolor*, a flowering shrub which was infested with a species of scale, *Aspidiotus*, unknown to me. The tea plants and the *lespedeza* we destroyed by burning and the balance of the plants, case and packing were fumigated with hydrocyanic acid gas.

On March 8th, five hundred (500) choice orchids arrived

from Manila and were treated with the same kind of gas. More grape vine cuttings arrived from California and were submitted to the fumes of bi-sulphide of carbon.

Two more plants of weeping lantana arrived by mail on March 23rd; the owner was notified over the telephone by Postmaster Pratt that they were held, as such plants would be as serious a pest as the up-right growing species. The owner stated that they were intended for hanging baskets on the porch; that, however, would not prevent birds from eating and distributing the seeds broadcast over the land, so the plants were burned. From Florida came by mail two tea plants and one *Sanchezia nobilis*, infested with scale insects; the plants were burned.

Two dwarf cedars (*Retinosporas*) from Japan were infested with an undetermined "mealy-bug" and were destroyed.

Mr. G. R. Ewart, on his return from Central America, brought with him in his baggage a package of Maragogopie Coffee seed, a very large and excellent variety that commands the highest price in the London market. Mr. Ewart submitted the seed to us for inspection. Upon examination no insect life or fungus disease could be detected. We, however, treated the seeds to a bath of Bordeaux mixture, after which he turned them over to Mr. Haughs, who will grow them for one season to test before planting them in permanent locations. This variety is said to thrive 100 feet above sea level to any elevation where Arabian Coffee grows and is very free from disease. This may prove to be a valuable acquisition to this Territory.

A small box containing two small bags of soil came from Fiji for analysis. Upon examination the only thing found therein was a small land shell.

On the S. S. "Manchuria" came one case of sugar cane from Formosa. Before inspection we took the precaution of fumigating it with hydrocyanic acid gas, after which, on inspection of the top layer of the cuttings in the case we found nearly every bud had been eaten out by some insect entering the bud and making its exit through a small hole between the joints, even to the top of the cane. The holes were from one-thirty-second to one-sixteenth of an inch in diameter, causing a slight discoloration or souring of the juices. The stems had considerable smut, probably caused by mealy bugs, as we found a few. No further inspection was made and all, including box and packing, was burned.

From Washington, D. C., came by mail a small white historical oak tree; upon inspection we found a root borer which we dug out, it measured about half an inch long. No further evidence of insect life was found, the tree was fumigated and passed.

On May 11th we received from Prof. Koebele then on the Mexican border, two jars and a small box containing beneficial insects for "mealy bugs" and "horn-flies" which were turned over to Mr. Kotinsky for propagation.

Through your consent and at the request of Acting Governor Atkinson and Mr. J. B. Castle, Mr. Kotinsky has three times visited with them the Molokan settlement on the island of Kauai, in the capacity of Russian interpreter. A portion of the time when on such missions he also devoted to entomological work. We had received information from a merchant on that island that his leather and some other goods were attacked by insects (*Catorama mexicana*, Cher.). I requested Mr. Kotinsky to call and give the owner the necessary information regarding fumigation with carbon bi-sulphide, which was done.

Respectfully submitted,

ALEXANDER CRAW,

Superintendent of Entomology and Inspector.

STACK ENSILAGE.

In many countries provision against inevitable drought and against periods of shortage of fodder has been made by means of the ensilage stack. Although good results have accrued from this method it should never be resorted to where a proper silo may be constructed, as the latter is in every way more satisfactory and economical. In constructing an ensilage stack it is of the first importance to exclude air by close packing and advantage may well be taken of a disused pit or barn. The fodder to be preserved should be stacked butt-end outward and care must be taken to insure as great pressure as possible. To obtain this heavy lumber should be placed upon the fodder at the end of each day's work and only removed when the work is resumed. Even distribution of weight must be obtained by laying each layer evenly and by maintaining a regular contour. Upon completion of the stack the lumber should be left upon the top and the whole covered in such a way as to exclude rain. Small stacks are very extravagant as the fodder for a foot inwards is useless for feeding.

A metal pipe built perpendicularly into the stack provides an easy way of determining the temperature by means of a thermometer attached to a string.

BY AUTHORITY.**SPECIAL WARNING NOTICE.****FIRES TO CLEAR LAND—WAIALUA DISTRICT, OAHU.**

Notice is hereby given that in accordance with **Section 6 of Act 71** the Session Laws of 1905, it is forbidden to start fires for the burning of brush, dry grass, etc., for a period of six (6) months from date, unless written permission of the District Fire Warden has been first obtained within that portion of the District of Waialua, Island of Oahu, & within the following boundaries:

On the South by the Waialua-Waianae District line, on the South-west by the Kaukonahua Stream; on the West by the Waialua Agricultural Company's new ditch from the Wahiawa dam and an extension of the line of the same, following approximately the 700 foot contour, to the Waimea boundary; on the North and East by the Waialua-Koolauka District Line.

The law reads, "such fires shall not be started during a heavy wind or without sufficient help present to control the same, and the fire shall be watched by the person setting the same, or by competent agents of his, until put out." The District Fire Warden is Mr. A. M. Nowell of Waialua.

RALPH S. HOŠMER,

Superintendent of Forestry and Chief Fire Warden.

Honolulu, T. H., March 7, 1906.

DISTRICT FIRE WARDEN—HANA, MAUI.

Notice is hereby given that Mr. John Chalmers has been appointed District Fire Warden in and for the District of Hana, Island of Maui, under the provision of Act 71 of the Sessions Laws of 1905.

C. S. HOLLOWAY,

Superintendent of Agriculture and Forestry.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Shower, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haugh, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSEMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 68 pp.
Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.
First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

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* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

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DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

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"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. II.

JULY, 1906

No. 7

Mr. Weinrich's paper advocating the extended cultivation of improved varieties of our local fruits is timely and we hope that its publication will tend to bring about a greater interest in this important subject. There is no doubt that Hawaii could not only fully supply the local fruit market with many varieties now imported, but could also ship enormous quantities of such fruits as mangoes and avocado pears to the mainland. The replacing of the large importation of citrus and other fruits with our local produce could be brought about most expeditiously by endeavoring to attract a class of white agriculturists to establish small fruit orchards to the Territory. Many fruits can be grown in these islands as readily and with as little capital and labor as on the coast, and in some cases the fruit-growing possibilities of Hawaii are unexcelled. The fig, for instance, can be grown here as prolifically and of as good size and flavor as anywhere else, and there is no doubt that in a very short time and at little expense a few acres of fig trees could be made to give a profitable return. Dried Hawaiian figs should be second to none, and if carefully prepared would easily replace the product on which California prides herself. In the cultivation of choice mangoes, avocado pears, figs, bananas and other fruits the opportunity for industrious workers are unsurpassed, and if proper advantage is taken of our climate and soil the time will not be far off when Hawaii is looked upon from the mainland as a great fruit-producing country. As Mr. Weinrich suggests, a book descriptive of our local fruits would be very acceptable, not only to tourists, but to the general public. It is imperative, however, that if such a publication be attempted on any scale it be prepared by one having a sufficient knowledge of the subject, not

only derived from practical local information, but founded upon an intimacy with the comparative pomology of other countries. There are probably not less than one hundred species of fruit trees in Honolulu, irrespective of innumerable varieties, and in some cases an extensive knowledge of botany is necessary to elucidate many errors and perplexities of local and popular nomenclature. Although such a work would be somewhat extensive, it is none the less necessary, but until such can be accomplished we hope that a small brochure will be prepared containing a popular description of our more common fruit trees and an illustration of each.

The Forester contains this month a very interest series of "Notes" by Dr. John Gifford, Agent of the United States Bureau of Forestry, upon Agricultural conditions in Southern Florida. As the locality dealt with is the only part of the mainland of the United States which approximates in climate and products to Hawaii, the information supplied is of particular value to our readers. It is to be hoped that Dr. Gifford's notes will be but the first installment of many others.

Messrs. Byron O. Clark, D. B. Murdoch and other gentlemen have also kindly promised to keep the Forester supplied from time to time with local matters of agricultural interest. An endeavor will be made to extend and render this feature of the paper permanent.

The current number publishes a graduation essay delivered at the Kamehameha Manual School commencement on June 3rd, entitled "What Science has done for Agriculture." The author says of the Kamehameha curriculum: "It is not intended to make us men of science, but rather to give training to enable us to make of use the results obtained by scientific men." If this is accomplished successfully the desire of the founder of the Kamehameha Schools will have been fulfilled.

Rr. Ralph Hosmer, Superintendent of Forestry, has returned to Honolulu after a successful visit to the mainland.

NOTES OF THE PINEAPPLE INDUSTRY ON MAUI.

BY MR. D. B. MURDOCH, Paia, Maui.

The hopes of the smaller agriculturists on Maui are largely centered in the pineapple industry. Excellent results have been attained along other lines by Mr. E. H. Bailey and others, in the upper Makawao district, but for a steady source of income there appear to be few things to pit against the raising of pineapples, unless possibly rubber.

Quite a number of pines are being raised by Portuguese farmers on the higher lands of Kaupakulua, at an elevation of about 1400 feet, but the more serious efforts are being made at Haiku, where the results continue to come up to, or even exceed, the early prognostications.

The chief growers in that district are the Haiku Fruit & Packing Co., the Haiku Sugar Co., H. M. Alexander, C. G. White, W. I. Wells, Jas. Lindsay, O. O. Burns and E. H. Bailey, also at Puuomalei, W. O. Aiken. Outside the area brought under cultivation by the two above-mentioned corporations, fully 150,000 plants have been set out by the independent planters during the past six months, and this number would probably have been doubled, had it been possible to import a larger supply of plants from the other islands.

On account of the summer crop ripening much earlier than usual, the pines average in weight perhaps a little less than those of last year, but are not much the worse for that, being still a fine average size for profitable work in the cannery. The fields certainly present a splendid sight, with unbroken rows of fruit, 9000 to the acre.

The summer pack of the Haiku Company will amount to over 10,000 cases. Late reports from the American market are most encouraging, and good prices for the Hawaiian product should rule for some time to come.

Excellent land can still be obtained in the district at reasonable rates, and there is no doubt that the Haiku colony will grow considerably during the next year or two.

NOTES FROM SOUTHERN FLORIDA.

BY DR. JOHN GIFFORD, *Agent U. S. Bureau of Forestry.*

Owing to the facts that the only tropical territory in the mainland of the United States is Southern Florida, that the cultivation of several strictly tropical fruits and vegetables is now in extensive operation, that the region is in close touch with the West Indies, and at the same time near the northern markets both by water and rail, the writer is of the opinion that notes from this district might be of interest to the people of Hawaii.

The Florida East Coast Railroad, although not an ideal concern, has been influential in opening up and developing a vast region of great possibilities. For some time the terminus has been Miami, with direct connection by steamer with Nassau and Havana, but now the daring project of extending the line through swamp and glade, across miles of water along a string of islands, called the Keys, to the city of Key West, is now actually nearing completion, although the work of finishing the bridges will still consume some time. With the help of ferries, however, rail communication with Havana is near at hand. It is stated that Pullman cars will be carried from Key West to Havana on heavy ferry boats and that the journey across the Gulf stream will only consume from four to five hours.

Our vegetation is tropical and the nearest point of the Bahamas, which belong to Great Britain, is only about fifty miles distant.

At present we are in the midst of the pineapple season. The crop on the Keys is now almost picked and the yield for this season is estimated at 40,000 crates. The pineapples on the mainland, which are a few days later, are now being rushed to northern markets by the train load. Pineapples are selling from \$2.75 to \$3.00 per crate, which is considered a fair price.

Limes are also being picked and are in great demand. These are grown mostly on the Keys, since the Key lime is of fine quality and ships or carries better than mainland limes. They are bringing \$1.25 per hundred. If this price holds there will be fortunes made in this fruit within the next few years, since large tracts of virgin hammock soil are being cleared and planted on the Keys along the line of the railroad extension. As to mangoes, the crop is not large this season, but many of the trees of high quality which have been inarched, will begin to bear for

the first time. I refer to the *Alphonso, Gordon, Lathrop and Mulgoba varieties, which promise to be far superior to any of our common seedling stock. It is stated that the Cambodian mango, which is a distinct species, breeds true to seed and is of fine quality. If so, it is a great boon, since the process of inarching the mango on a large scale is tedious work and not altogether satisfactory. •

The people of Florida feel that in the Trapp avocado they have a prize. This variety holds its fruit until late in winter when the price is enormously high. Ordinarily our avocados ripen in late summer and fall. This tree, now growing in Coconut Grove, Florida, probably came originally from Cuba via Key West.

The avocado is ordinarily called the alligator pear, but is it not time to drop such an inappropriate name? It is not a pear and the word alligator in this instance is nothing more than a bad corruption of the Mexican avocado.

Speaking of names, we have been calling the sapodilla by its wrong scientific name. The name *Achras Sapota* belongs to another plant, and according to Coville *Sapota Zapodilla* by the rules of botanical nomenclature is now its botanical title. The Mexicans call it sapote. Why do we call it "sapodilla," which is merely the diminutive of sapote? So far as I know there is no big and little sapote, in fact, the only other sapota is the white sapota or "sapote blanco," which is very unlike and dis-

* The following description of varieties here named are quoted from Mr. Higgins' recently published Bulletin on the Mango. The numbers refer to those in Mr. Higgins' list:

35. The Alphonse, Alphonso, or Alfoos. This is one of the most noted of the India mangoes. Size, medium to large; color, greenish yellow on the unexposed side and running to yellow on the exposed side, which is overlaid with light red; peeling qualities excellent; texture excellent, may be readily eaten with a spoon; flavor unique, with a peculiar mingling of acidity and sweetness in the bright colored fruit.

37. Mulgoba. Form roundish, oblique, reniform; size, large, weighing from three-quarters to one pound; surface smooth and undulating; color yellow, beautifully blushed with red and faintly dotted with numerous brown dots; skin thin, tough, tenacious; seed reniform, oval, rather large; fiber scanty, fine and tender; flesh rich, apricot yellow, very tender, melting and juicy, sweet, rich, fragrant; quality very good.

42. Cambodiana. A very choice variety recently introduced from the Section of Seed and Plant Introduction of the United States Department of Agriculture.

tantly related to the sapodilla. We have a fruit called the mamee sapota, but this also is a very distant relative to the sapodilla. Why not call the alligator pear, the avocado, and the sapodilla the zapote?

The one great problem next to the railroad construction to Key West which is now being ardently discussed, is the drainage of that vast territory called the Everglades. It is the pet project of the present Governor. Already work has begun. Some day it will be one great patch of vegetables and cane. Our representative in Congress has asked to have three million dollars diverted from the irrigation fund for the drainage of the federal land in the Everglades. Of the progress of this project I will write more in another letter.

How accidentally strange foreign plants get introduced by the greatest of all factors in plant introduction—the hand of man through the help of the mails. How indirectly too these often pass from friend to friend. One of my neighbors says, “now here is a cherimoyer, it is unlike all other cherimoyers in this district. A friend sent the seed by mail from Callao, South America.” Another says, “this mango is different from any I have seen before, a missionary friend sent it from a remote section of India.” Only this morning a friend called and said, “I have two strange trees on my place. They are now in bloom. They were there when I purchased the property. I have no idea what they are.” A botanical study of the flower soon revealed that the tree was none other than *Kigelia africana*, the sausage-tree of Equatorial Africa.

I don't know whether you have it or not in Hawaii. I sent some seeds to your forestry department last year, but the Florida madeira, which is the true mahogany, is worthy of extensive planting. On our Keys it grows on coral rocks close to the sea, so close in fact that it must get salted at times. It grows in the rock with little soil, stands strong winds and yields the king of all woods. In spite of the fact that our boatmen are constantly cutting it for boat frames, cleats, etc., it is still quite abundant. In addition to being so useful and universally known, it is highly ornamental. Another tree which I saw in Porto Rico which pleased me because of the value of its wood and the beauty of its foliage and flowers is the *maga* (*Thespesia grandiflora*). Like the mahogany, it grows close to the sea on coral rock. I have tried in vain to get seeds of this valuable tree.

REPORT ON HORTICULTURAL QUARANTINE INSPECTION WORK.

Honolulu, June 20, 1906.

To the Honorable Board of Commissioners of
Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—Owing to the disaster in 'San Francisco and the consequent interruption in ocean transportation during the past three weeks, besides the fact that May is usually a dull season for the shipment of trees and plants, we have very little to report since your last meeting (May 16th).

During this time there arrived in port thirty-one (31) steamships and sailing vessels from outside the Territory. We found thereon six thousand four hundred and nineteen (6419) packages of fruits and vegetables and seven (7) cases and boxes of trees and plants, besides forty (40) packages of plants and seeds by mail.

ANOTHER FUMIGATORY.

Heretofore, when necessary to disinfect any plants arriving by mail, we have had to remove the plants to one of our fumigatories on the docks. With the Executive Officer's consent and Postmaster Pratt's permission we have had a fumigatory made and established in the postoffice, which will expedite such work in the future. As no fire is required in our fumigating work, there is positively no danger of fire to any building.

NEW ECONOMIC TROPICAL PLANTS.

One Wardian case from Ceylon arrived via Hongkong containing an assortment of tropical plants for experimental purposes. They were fumigated and the soil packing was destroyed. Two plants were infested with scale insects.

INFESTED CACTI CUTTINGS.

Seven cuttings of Cacti from California infested with scale and mites were destroyed by tying weights and dropping them into the harbor.

RICE WEEVILS.

Three packages of sorghum seed came by mail from New York, that were found slightly infested with "rice weevils" (*Calandra oryza*). This we successfully treated with the fumes of carbon bisulphide.

INFESTED MANGO SEEDS.

On Sunday, June 10th, the transport "Sheridan" arrived from Manila. In her mail she had a tin box of mango seeds packed in fine charcoal. Upon inspection the insides of the seeds were seriously infested with very small eight-legged silvery mites. The owner was notified and the condition of the seed was shown to him, after which the seed and packing, including the wrapper, were burned.

MANGO WEEVIL.

In my report to you, dated October 2, 1905, I called your attention to the existence of a mango fruit pest that was found infesting the seeds of that fruit in two sections of Oahu. Mr. Austin and I immediately visited the district, but found the crop was over for the season. Upon an examination of a few dry seeds found under the trees we discovered several living larvae and beetles. We called the attention of the superintendent of the estate to the fact and requested him to have all seed carefully collected and burned, which was done. During the present crop of mangoes we have made a careful inspection to ascertain the extent of its spread and am sorry to report that it is more widely distributed than any one that has taken interest in this was aware.

Mr. Austin and I visited Moanalua and the valley adjacent and estimate that over seventy-five per cent. of the present crop contains the pest from very small larvae to pupae. No mature beetles were found during our examination, even with collecting sheets.

During 1905, Mr. D. L. Van Dine first called public attention to this beetle on Oahu, but previous to that Mr. S. Wilder called the attention of his brother, Gerrit, to a beetle found by him in a mango seed from Moanalua, which he submitted to Prof. R. C. L. Perkins of the Hawaiian Sugar Planters' Association. Mr. Van Dine estimated that sixty per cent. of the fruit was attacked,

which indicated that the beetle had been here for some time. An elderly Hawaiian living at the head of a small valley we visited informed us that he found the beetle three seasons ago. As mangoes have been freely sold and distributed from the infected districts, I fear that it has now been scattered over this island and probably carried to others of the group. As the mango trees loaded with fruit in the infected district overhanging the public thoroughfare and a district school is located in the midst every facility has been given for the pest's distribution. Our inspection extended from Palama valley, in Honolulu, to within a mile of Pearl City, wherein we found the pest, so I feel confident from the large size of the trees and character of the soil and undergrowth that it will be impossible to stamp it out of the Territory, even by the destruction of the present or two succeeding crops, so on that account I would not advise your Board to expend any money in the attempt.

While the weevil is found inside there is no evidence of where it entered and no damage appears to be inflicted upon the fruit other than destroying the germination of the seed.

BENEFICIAL INSECTS.

In my last report to you I referred to the receipt of several beneficial insects from Prof. Koebele, which were turned over to Mr. Kotinsky for propagation. The past two weeks he has liberated two colonies our doors and has others in breeding jars in the office.

Respectfully yours,

ALEXANDER CRAW,

Superintendent of Entomology and Inspector.

CASTOR OIL.

The uses of castor oil are manifold. Besides its ordinary medicinal use as a laxative or purgative, if well rubbed into harness it makes the leather water-proof, keeps it from being touched by cockroaches or rats. It can be used instead of soap in making kerosene emulsion for spraying or washing orange trees. It is a good insecticide and fungicide if used with one part of kerosene, one part of sweet oil to one part castor oil. This will kill hair lice, cure ring-worm and mange on animals, cure scaly-leg on fowls and also mild cases of yaws in fowls if painted on the eruptions, and will kill ticks, fleas and bugs.—*Journal of the Jamaica Agricultural Society.*

ENTOMOLOGICAL NOTES FROM THE DIVISION OF
ENTOMOLOGY, BOARD OF AGRICUL-
TURE AND FORESTRY.

BY JACOB KOTINSKY.

THE TOBACCO SPLITWORM, AN ENEMY OF TOMATO, EGG PLANT
AND POHA IN HAWAII.

Phthorimaea operculella, Zell.

The writer has frequently found a caterpillar within tomatoes bought in the market. After several attempts he has succeeded, in March of this year, to rear a pretty, silvery grey moth. A month later a large number of the moths were raised from the splitworm found at work in egg plant leaves and from a number of them hidden beneath the calyx leaves adhering to the fruit. In January of this year, Mr. R. V. Woods, a valuable and obliging correspondent of this office, from North Kona, Hawaii, sent us some stems of Poha or Cape Gooseberry (*Physalis peruviana*, L.) into the upper portions of the stems of which a caterpillar was found boring and from this caterpillar the above moth was bred. Specimens of each of these were sent to the United States Bureau of Entomology and were there kindly identified with the above by Mr. A. Busck. In the "Hawaiian Forester and Agriculturist," Vol. II, pp. 76-79, also Bulletin 10, pp. 7-9, of the Hawaii Agricultural Experiment Station, Mr. Van Dine records the insect as occurring in Hamakua, where it is injurious to tobacco. He also gives there illustrations of the larva, pupa and moth. It is well to bear in mind that the food plants above enumerated, including tobacco, are members of the same plant family, *Solanaceae*. Its habits in the various plants, however, do not seem to be identical, since it lives upon the leaves of the egg plant and tobacco, in the fruit of tomato and the stems of poha. As Orientals are principally engaged in the cultivation of vegetables upon these islands, we hear very little complaint of insect injury to that class of plants. As a matter of fact, however, the writer has observed more instances of damage to tomatoes by this caterpillar than by the melon fly (*Dacus cucurbitae*, Coq.), which he has observed in only one instance in tomatoes. Upon the egg

plant the larvae had evidently gathered beneath the calyx for protection during pupation, the principal injury being done to the leaves. In the pohia the damage was very serious, since the injury to the stem precluded blossoming and consequent formation of fruit.

NATURAL ENEMIES.

From the pohia stems received from Kona a specimen of *Chelonus blackburni*, Cam., was bred. This is a good sized, four-winged fly—i. e., good sized for an internal parasite—which cannot be mistaken because of the strong contrast in color between the apical segments of the abdomen which are pale yellow, the rest of the insect being black. From the tomato and egg plant worms another parasite was bred; this was named by Dr. Ashmead, through the kindness of the United States Bureau of Entomology, as *Limnerium polymesiale*, Cam. This insect Mr. Perkins tells me is more or less common over all these islands and doubtless does a good deal of good. It is evidently, however, not sufficient to materially check damage by the splitworm since in either instance the number of moths bred exceeded many times that of the parasite.

REMEDIES.

Clean culture, with all it implies, is doubtless the very best means we have at present for combating this insect. By clean culture we mean the eradication of all foreign, especially allied plants, from between those cultivated. The removal of all rubbish from the vicinity of the plants will deprive the caterpillars from shelter during pupation and expose them to attack by natural enemies and other untoward conditions. Frequent cultivation of the soil between the plants will strengthen them at the same time destroying what larvae may be harbored beneath the surface. Finally, good attention to the plants in the way of an ample supply of food and water will invigorate the plants to overcome what injury might have been done to it.

WHAT SCIENCE HAS DONE FOR AGRICULTURE.

Graduation essay delivered by Ire Yowell, '06, Kamehameha Manual School commencement, June 30, 1906:

"The ideal agriculture maintains itself. It is able to thrive forever on the same land and from its own resources. The ideal farm becomes more productive and better stocked with time, and this without the aid of outside contributions. But such conditions are only possible by the application of scientific methods and science.

Modern agriculture owes its wonderful development to the rapid advancement of scientific knowledge, and the application of scientific facts and methods to agriculture pursuits.

Other things being equal the most successful farmer of today is the agriculturist who knows the reason why as well as the how. The spirit of enquiry, observation, patience, accuracy and systematic attention to all farm operations, and the love for experiment, is the scientific spirit, and in no field of endeavor more than in agriculture is this spirit more necessary for advancement.

Agricultural science in its fullest meaning comprehends a large number of subjects. It includes something from nearly every department of human learning. But the art of agriculture is based more directly on the natural sciences of geology, meteorology, physics, chemistry, botany, physiology and mechanics. Today it is no less concerned in political and social economy.

Scientific agriculture, as now accepted, dates from the investigations of the great German chemist, Liebig. A little more than a half century ago he laid down the broad principles which, with few exceptions, have borne the test of time.

By his teachings we know that a fertile soil contains all the elements of plant food. Each drop removes a portion of these ingredients, some of which are replaced by air and water, others are lost if not replaced by man.

While he recognized the importance of humus as a source of plant food as held by his predecessors, he further made clear that the ingredients of ash are essential to vegetable growth. The importance of phosphates in the nourishment of crops was his discovery, and it was he who suggested their source. It was thus that science entirely revolutionized the methods of manuring and created the new and important fertilizer industry.

Based upon these discoveries the German government instituted experiment stations. Other countries were quick to follow in establishing these facilities for scientific investigations. Every civilized country in the world now recognizes the immense importance of these institutions to their agricultural resources.

In the United States particularly has the government been quick to give the farmer every scientific aid possible. No better illustration of the value of such aid to agriculture could be given than to point out the results obtained by the United States experiment stations, and especially should attention be called to the splendid scientific work being done by the Hawaiian Sugar Planters' Experiment Station of Hawaii, in the aid of our staple crop, which it was my recent privilege to be shown in all its many phases.

Perhaps science has given no greater aid to agriculture than in working out the nitrogen problem. We owe the solution of this problem to the science of bacteriology.

It was formerly thought that plants absorbed their nitrogen by means of their leaves. But we now know that the agency of bacteria inhabiting the root nodules of leguminous plants, such as clover and peas, are the only means of assimilating nitrogen directly from the air. By this knowledge we are now enabled to make fertile otherwise sterile soil. Upon the investigations of Prof. Nobbe of Saxony, and others, is based the recent theory of soil inoculation with nitrifying organisms.

The science of bacteriology is also to be credited with the remarkable advance in dairying. The souring of milk, the ripening of cream, the flavor of butter and cheese, is now directly traced to the action of bacteria. In consequence the rule of thumb butter-making days are a thing of the past.

It is because of the importance of pure, wholesome milk as an article of diet for our students, and because dairying is among the most intensive divisions of agriculture, including as it does, every branch of farming, and the sciences related to it, that dairy husbandry has been given special prominence in our agricultural department at Kamehameha.

Here the student begin with the tillage of the soil, cultivating and harvesting the crops, compounding feeds, feeding and milking the cows, testing the milk, separating the cream, and making butter. He not only assists in the practical care and

management of the dairy, but he learns the underlying principles of operations and processes as well.

It is not intended to make us men of science, but rather to give a training to enable us to make use of the results obtained by scientific men.

The physical properties of the soil and their bearing upon its fertility is a subject which in recent years has received much attention from scientific investigators. The knowledge gained from agricultural physics is responsible for the striking results which can be produced by skilful tillage and drainage even without the aid of fertilizers.

Our scientific knowledge of the structure and physiology of plants is of like recent development. By selection and cross-breeding the present high qualities and productiveness of our staple crops may be directly traced. The improvement of sugar cane, sugar beets, cotton, wheat, fruits, vegetables and flowers are good illustrations.

In this connection the eminent horticulturist, Luther Burbank, should be mentioned. He has given us an inkling of the vast possibilities of plant breeding, which can hardly be estimated. The same holds true in animal breeding, the principles of which are but being understood and utilized.

In the incessant fight which the farmer has to wage against insect pests, and plant diseases, he calls to his aid the sciences of entomology and pathology. Were it not for these branches of science it is doubtful whether today one thriving acre of sugar cane could be found in these islands. It would be interesting to cite examples of work done along these lines. But I commend you to visit the several splendidly equipped experiment stations maintained in Honolulu for Hawaii's agriculture.

Likewise have physiology and sanitation been an inestimable value to the complex art of stock feeding, care and general management. Harnessed to scientific breeding, these sciences more than any other factor, are to be given credit for the wonderful and economic milk yield, prime live stock and the general healthfulness of large herds of farm animals.

Thanks to veterinary science, tuberculosis is being stamped from our herds, and other dreaded contagious diseases are under control.

Much concern in recent years has been occasioned by the wanton destruction of our great forests. But scientific forestry

has stepped in and promises not only the full restoration of past waste, but the foresting of large areas to which tree growths have heretofore been unknown. Our own Tantalus, we are told, was once as barren as Punchbowl. What a contrast has tree planting done for this one spot!

The great reclamation enterprises in the arid west which will convert desert lands into productive fields; the introduction of the mower, the combined harvester, the cream separator, steam and electricity and other advance appliances of mechanics for the more perfect and economic replacing of manual labor are examples of the contributions made by engineering and mechanical professions.

That there is any conflict between science and art, or theory and practice, is an error. They are, as they ever have been and always must remain, in perfect harmony. If they appear to jar it is because we have something untrue or incomplete in what we call our science or else we do not see correctly.

GUATEMALAN COFFEE.

Shortly after 1860, coffee-growing began to take the place in Guatemala of the cultivation of the indigo and cochineal plants that had been grown there for many years previous to the discovery of the chemical dyes that are now the colors known to the commercial world. From that time until recently, the business gradually grew, until in 1902, the coffee crop exceeded 74 million pounds of clean coffee. Only a small portion of the area of the country is adapted to the cultivation of coffee. At present good government coffee lands are very scarce, but when found can be had for about 1s. 3d to 1s. 8d. per acre, and when brought under cultivation with a good stand of trees, are worth from £20 to £100 or more. The coffee of commerce grows in altitudes of 1000 to 6000 feet; the best and most prolific trees at 2000 to 4000 feet. The labor is cheap, from 1½d. to 10d. a day. The industry as yet has not been brought to a very high state. Only in a few cases has an effort been made to crowd the coffee tree to see what they could be made to do. Guatemala coffee is rated very highly in the markets of the world, and is the principal industry of the country, it giving employment to more than one-half of the population for about half of the year, during the harvesting time.—*Journal of the Society of Arts*, October 6th.

THE NECESSITY OF GROWING MORE FRUITS IN HAWAII.

BY MR. WEINRICH, *being a paper read at the last meeting of the
Farmers' Institute of the Territory of Hawaii.*

The primary object in giving this paper is to bring before the people the close relation that native fruits bear to the development of the country. We need but look to California to see what fruit culture has done for that wonderful state. We turn our attention to New York to see what grapes have done for that country. We look to Delaware to find that this state is known, if for no other reason, for its peaches. And so we could go through the states one by one and find that nearly every state is known for one or more varieties of its own kind of fruit.

The far-reaching general impression of Hawaii is that it is a tropical country, and naturally one expects to find here all the fruits that are found in strictly tropical countries. Unfortunately this general impression of tropical Hawaii is not carried out in fruit raising. To prove this we need but go to the fish market (Hawaii's fruit market) or any of the other fruit stands in town to see how little Hawaiian grown fruits can be purchased. To my mind this deficiency in fruit growing does more harm, causes more disappointment to the tourists and travelers than can ever be counteracted by all the efforts of the Hawaiian Promotion Committee. By glancing at the menus of the leading hotels we are again confronted by the fact that Hawaii is not doing what it can or what it ought to do in this line.

The chief attraction to the tourist in Hawaii is its uniqueness. This uniqueness should extend, not only to the scenery and people, but also to the food we provide.

It is no doubt true that at any of the leading hotels in town, the serving of Hawaiian grown fruits is rather the exception than the rule. Even when they are served the quality and flavor are of such a nature as to produce a feeling of distaste rather than pleasure.

Take one of our commonest garden fruits, the papaya, and you will be surprised at the difference in taste of those purchased from the Orientals or in the market and that grown in your own yard.

Take another very common fruit, the native orange, and one

finds how inferior in quality it is to the California orange. It is very small and most noticeable of all is its large number of seeds. These objections could be eliminated by proper selection and cultivation. I do not wish to be misunderstood in this that good oranges are not grown here. The fact is that the best oranges in the world are grown in Honolulu, but in private grounds. This private enterprise does not supply the needs of the tourist and the general public.

One striking illustration of native grown fruits is the alligator (or more properly the avocado) pear. It is well known that this pear is the best native fruit we have in the market. This fruit has probably done more to advertise this country than any other of our fruits. Every visitor and every tourist goes away with some impression of this fruit, good, bad or indifferent, but he at least carries an impression, something whereby he remembers the country and that is what we desire. Even this fruit, the best we market, is not equal to that grown in private yards.

How few good mangoes are to be had by purchase! Unless one has friends, having trees in their yards, it is almost impossible to obtain such a thing as a good mango. It should be picked, iced and eaten within a few hours, but not as we find them in the market, having been knocked down from the trees and allowed to ripen in the fruitstands. This treatment takes away all the individual taste and reduces what should have been a luscious fruit into a pulpy mass. One of the most undesirable features of this fruit to a stranger is the flavor of turpentine. This flavor is not found in the better varieties if carefully peeled. These better varieties are only found in private yards.

Last summer I made the experiment of buying some of all the varieties of this fruit I could find in the market and found, much to my disappointment, that not one of them was palatable. It has been my personal experience, and also that of others, that many tourists to this country who have spoken of a dislike for mangoes, have been completely won over by being offered, and eating, one mango of good variety.

Of the several varieties of bananas grown commonly on these islands, the "cooking banana," as it is usually called, is the best we find in the market. This cooked makes a delicious vegetable. As we all know of the "Chinese" banana, the one exported, the best and largest fruit is all sent away from here. We never see

here the quality of this variety that the Californian enjoys. This ought not to be so. What is pronounced by the majority of people as our best banana, the apple variety, is little known. It is small but has a very pleasant and decided flavor. Though it grows very easily, it is seldom found in the market.

In passing I would like to draw a comparison between Hawaii and the Island of Jamaica. One has but to read the history of Jamaica to see that, if it were not for the banana industry, that island would have practically no exports. Through the efforts of one man, this island has become foremost in the line of banana exportation.

One of our finest fruits and yet one that is hardly known is the wi. It grows easily, though a little difficult to start, it being necessary to crack the hard shell of the seed before planting. The fruit falls easily from the tree in a wind, even before maturing, so that it needs a breakwind. But when started and protected will yield as great a quantity of fruit as the mango does.

There is nothing more pleasing to my taste than half of a good, iced grapefruit, well sprinkled with sugar and served as an appetizer before dinner. It is well known by those who have had the opportunity of eating them that the Hawaiian grapefruit far excels any of the varieties imported. Our grapefruit is about the size of that grown in California, but is much more juicy and finer in flavor, and is almost never seen in the markets.

One very well known fruit is the lime. Enough has been done with this in the line of growing and importing from the other islands to supply the local market. This fruit is of good quality though small.

The lemon, which can be grown well in these islands, is not often seen.

As yet we have not been able to compete with California in the line of raising grapes. It is well known that one or two varieties do splendidly here, but unfortunately those who grow them pick them green and that naturally makes them sour. But when these grapes are allowed to fully mature, they turn out to be delicious, equal to those raised in the States. The Federal Government, seeing the possibilities of this industry, has decided to experiment with about 250 varieties to determine the ones best adapted to the Hawaiian conditions and climate.

Perhaps of all the fruits, the fig is the most easily obtained.

We, no doubt, have a superior fig for the table than the California variety, which though sweeter and so better adapted for drying, is much smaller and less juicy.

Not many berries have been tried to any extent in this country. During the season strawberries are quite plentiful and sold at a fair price. The mulberry is never sold, but is being cultivated to some extent by private individuals. The blackberry also is never seen in the markets but grows well at high elevations as has been proven by the patch Mr. Baldwin set out on Haleakala. A successful experiment has lately been made by Mr. Allan Herbet in grafting a cultivated variety of blackberry on the hardy wild native variety. A good sized blackberry of good flavor is the result.

During the hot summer months one of the fruits that greatly appeal to us is the watermelon. Considerable has been done with this fruit, which shows that with care and patience and under proper conditions this will grow to be of large size and delicious flavor.

The muskmelon seems to have quite a struggle to hold its own, but under the proper conditions this also can be made to grow well.

One of the fruits which is scarcely ever seen is the breadfruit. To my mind there are few things that surpass it when attention has been paid to the proper time for cooking.

The commonest wild fruit which is found along many of the roadsides is the guava. When one considers the flavor of this fruit and the possibilities of eliminating the vast number of seeds within it, we find that we have one more worthy fruit belonging to the tropical family. Among the varieties of this fruit, little known, but worth attention, is what is called the strawberry guava. It is small and red and has a most delicate and pleasing flavor.

The most successful fruit industry that we have is the pineapple. Because it has been given so much attention, it is one fruit we can buy to good advantage. It has been studied and many varieties tested and cultivated till we have a pine as superior to the native pine as one could imagine. Every one here knows that we can lead the world in growing this fruit. If as much attention, thought and capital were invested in some of our other fruits no doubt we could win a high reputation abroad for our superior oranges, mangoes, alligator pears, breadfruit, etc.

Some of the rarer fruits such as the watermelons, custard apple, loquat, soursop, ohelo berry, grenadilla and others could be grown to good advantage.

The fruits I have enumerated are all well, or fairly well known. There are many more that have been experimented with and proven a success, for instance, the mangosteen, the durian and the roselle.

Gradually I believe the thought of my paper will be achieved as it is very slowly being achieved. As with the pineapple so also with many of our fruits, one would not need to depend entirely upon shipping the ripe fruits as they are for profit, but many of them could be made into delicious preserves, jams, jellies, etc. Of late years papaya orchards have been started and one can purchase that fruit at any time in the market but, as is the trouble with most of the fruits, they are picked too green and allowed to ripen in the market. This destroys their delicate flavor and instead of tourists discovering what delicious fruits we have here they wonder anyone can enjoy them.

Already the mango is being made into chutney for export, the papaya and Chinese orange into marmalade for local use, and the guava into jams and jelly. This is a beginning but it should grow till we can all invariably enjoy food fruits on our tables and plenty of them and also until they are made to give many in this country a good living by the sale of these put up in many tempting ways.

Could not the settlers who have land on the higher elevations help out Hawaii as well as themselves by giving some of their attention to this problem? Most fruits no doubt would do better in their cooler and more moist atmosphere than they do on the low lands. Of course the subject will need much thought and many experiments would need to be tried, though many have already been tried at Wahiawa and other places, so that it might be a number of years before this would be accomplished. But, as has been proven by other fruits, much can be done and when it is done, Hawaii will be a better land to live in.

After all this is accomplished, one more point, which to my mind is very important and which in fact could be done now to much profit, is to make both*malihini and kamaaina thoroughly familiar with the way to prepare and eat our fruits in order to

*NOTE: 'new-comer' and 'resident.'

most enjoy them. Take for instance the mango and the wi—if you insert a flat handled nutpick into the stem end of these fruits so that you have a convenient way of handling them you no longer wish you were in a bathtub while eating them. To those not accustomed to the alligator pear, when it is eaten with salt only it is very distasteful, but prepared with vinegar, pepper and salt becomes palatable. The breadfruit, if eaten to advantage, must be allowed to so thoroughly ripen that when handled its sides will dent. And so on with nearly all our fruits. There are good and bad ways of preparing them, all of which each housekeeper and hotel and restaurant manager should know.

By means of a booklet, (similar to this one I have on Jamaica, which I consider very excellent), all this knowledge could be easily brought before the people to the very great advantage of Hawaii and Hawaii's visitors.

SELECTION OF SEED: COCO-NUTS.

The copra produced by 1,000 Ceylon ordinary nuts is about twice as much as that obtained from Seychelles nuts. This result has been obtained in the same soil, under the influence of the same climate, and is entirely due to selection. It is to be hoped that the discussion raised on the subject by the planters after their having seen the nuts introduced from Ceylon may prove the beginning of a careful selection of nuts for planting in Seychelles. Many of them have already informed me that they have found on their estates a few of their trees producing nuts similar to those of Ceylon and that they intend keeping them for propagation. It is probable that the trees which produce very small nuts have less requirements than those which produce bigger nuts, and that varieties which produce big nuts normally will bear smaller nuts if they are starved out. But when one thinks of the very trifling amount of plant food which is removed from the soil by coco-nut cultivation, there seems to be no difficulty in supplying the elements which are required to a greater extent by the big-nut varieties. The planter must choose between having small nuts without trouble and having double the crop by using proper methods and selection.—*Annual Colonial Report, 1904, Seychelles.*

KAU FOREST RESERVE.

At the meeting of the Board of Commissioners of Agriculture and Forestry, held on June 20th, the reports of the Committee on Forestry and of the Superintendent of Forestry on the proposed Kau Forest Reserve on Hawaii, were approved, and a resolution in regard thereto adopted. Following the usage of the Board the resolution and reports are published herewith.

RESOLUTION IN REGARD TO THE PROPOSED KAU FOREST RESERVE.

Resolved, That all those certain lands in the District of Kau, Island of Hawaii, bounded in general terms as follows:

Lying on the lower southern slope of Mauna Loa, bounded on the west and north by the land of Kahuku, on the east by the forest fence erected within the land of Kapapala by the Hawaiian Agricultural Company, and on the south by a line drawn across the various lands back of Pahala and Hutchinson plantations, at approximately the lower edge of the existing forest, and containing an approximate area of 75,000 acres, as recommended by a report of the Committee on Forestry, dated June 6, 1906, based on a report of the Superintendent of Forestry, dated March 31, 1906, both of which reports are on file in the office of the Board of Agriculture and Forestry, the boundaries of which proposed reservation more particularly appear by and on a map and description made in May, 1906, by the Hawaiian Government Survey Department, which said map is on file in said Survey Department and marked "Registered Map No. 2361," a copy of which said map and description are now on file in the office of this Board and made a part thereof, be approved as a forest reserve, to be called the Kau Forest Reserve.

Resolved, That the Board recommend to the Governor that the government lands lying within the boundaries of the said proposed Kau Forest Reserve be set apart by him, subject to vested rights therein, after the hearing required by law, as the Kau Forest Reserve.

REPORT OF THE COMMITTEE ON FORESTRY.

Honolulu, T. H., June 6, 1906.

Board of Commissioners of
Agriculture and Forestry,
Honolulu, Oahu.

Gentlemen:—Your Committee on Forestry have had under consideration the report of Ralph S. Hosmer, Superintendent of Forestry, dated March 31, 1906, recommending the establishment of a forest reserve in the District of Kau. After giving the matter careful consideration your Committee approve of the recommendation of the said report and recommend that the Governor be requested to declare the area therein recommended to be a forest reserve, and to set apart the government lands lying within the boundaries of such proposed reserve, which are available for such purpose, as a forest reservation.

Your Committee note with pleasure and commendation the public and enlightened spirit in which the Hawaiian Agricultural Company and the Hutchinson Plantation Company have treated the forest question in this district. The great bulk of the lands involved in this proposed reservation are under long term leases to the two corporations in question, which leases are about to expire, with no assurance that the present lessees will again secure the lands. Notwithstanding this fact and that they were paying rent on the land in forest, the two corporations in question have fenced out large forest areas from stock and have largely developed the water supply on the same, by means of tunnels and ditches and have built lengthy and expensive fences for the sole and express purpose of preserving the forest.

The Hutchinson Company has built 17 miles of fence and the Hawaiian Agricultural Company 35 miles of fence in this connection, at their own expense and without cost to the government. As a result of this wise policy the forest enclosed has not only held its own but has recovered and reforested a large area which had become more or less damaged by cattle; while a large amount of water has been developed where practically no water available for economical purposes previously existed.

If the same enlightened policy were pursued throughout the

Territory it would greatly simplify the forest problem and redound to the public benefit.

Your Committee herewith present a resolution for the purpose of carrying this recommendation into effect.

We remain,

Your obedient servants,

L. A. THURSTON,
ALFRED W. CARTER,
W. M. GIFFARD.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

March 31, 1906.

Committee on Forestry,
Board of Commissioners of
Agriculture and Forestry,
Honolulu, Oahu.

Gentlemen:—I beg to submit the following report, with recommendations, upon the proposed Kau Forest Reserve, in the District of Kau, Island of Hawaii. This report is based upon field work done by me during visits to Kau made in February, 1904, and August, 1905, supplemented by other information obtained between and since those visits. The report deals with the forest problems that are presented in the part of Kau covered by the proposed forest reserve. It will be followed by a supplementary report containing a technical description of the reserve boundary line herein proposed. As soon as this description is in hand, I recommend that the Board pass a resolution favoring the reserve, that the matter may take the usual course.

LOCATION AND AREA.

The area covered by the proposed Kau Forest Reserve may be roughly described as that portion of the District of Kau, lying on the lower southern slope of Mauna Loa, bounded on the west and north by the land of Kahuku, on the east by the forest fence erected within the lands of Kapapala by the Hawaiian Agricultural Company, and on the south by a line, fenced in part, drawn across the various lands back of the Pahala and Hutchinson plantations at approximately the lower edge of the existing forest. The gross area of the Kau Forest Reserve is approximately

75,500 acres, of which all but a small percentage is government land.

OBJECT.

The object of the Kau Forest Reserve is to insure the continued protection of the forest on the lower slopes of Mauna Loa, because of its importance in maintaining the favorable conditions on which the water supply of the agricultural lands in the Kau District depends.

DESCRIPTION OF THE TRACT.

At present the government land within the boundaries of the proposed Kau Forest Reserve is for the most part under lease either to the Hawaiian Agricultural Company or to the Hutchinson Sugar Plantation Company. Many of the leases are about to expire and of the remainder of the government land there are some forest tracts that are not now under lease.

The important leases that have some time yet to run are for the land of Waiohinu and the Puumakaa-Kiolakaa Forest Tract, both leased to the Hutchinson Sugar Plantation Company, the leases running respectively until April 1, 1914, and May 24, 1923. These lands adjoin one another and form the western end of the proposed forest reserve. Toward the eastern end, the lease on the tract known as the Kaalaala-Makakupu Forest, to the Hawaiian Agricultural Company, runs until July 1, 1924. Under the old classification the land of Waiohinu was a "crown land," all the rest of the government tracts within the reserve were "government lands."

FENCES.

Most of the existing leases contain clauses requiring the protection of the forest. That for the Puumakaa-Kiolakaa Forest Tract, made in 1902, requires that a fence be built and maintained around three sides of the tract and in lieu of the fourth side, along the Kahuku boundary until it meets the forest fence built and maintained by the Hawaiian Agricultural Company. The Puumakaa-Kiolakaa fence, around the western end of the reserve, was begun about three years ago by the Hon. George C. Hewitt, then manager of the Hutchinson plantation, and was completed during the summer of 1905 by Mr. Carl Wolters, the present manager. It is approximately 17 miles in length.

The entire eastern part of the proposed reserve, containing about half of the total area, was voluntarily set apart and has been treated as a private forest reserve for the last ten years by the Hawaiian Agricultural Company, the lessees of the government forest lands. At the suggestion of Mr. George H. Robertson, manager of C. Brewer & Company, a forest fence was built extending from Puu Enuhe, on the western boundary of the Bishop Estate land of Punaluu, up through the forest to the boundary of Kahuku, thence following the Kahuku line to the eastward, although not always on the exact boundary, to the land of Kapapala; thence out into Kapapala between two and three miles and makai to a point near the lower edge of the forest, nearly straight northwest from the "Half Way House," thence along, but a little within, the lower edge of the forest to a point near the Kapapala boundary where it connects with the cane field fences of the Pahala Plantation, which extend to the initial point. The fence was begun in August, 1894, and completed in February, 1896. The length of the fence as originally constructed was 35 miles; the total cost of construction was \$12,000, which figure does not include the cost of repairs made a few years ago, nor the amount now annually expended for regular maintenance.

As first built the fence on Kapapala was about a mile to the eastward of its present location, a portion of the reserved area having been cut out as a paddock some five years ago by the erection of a new fence up and down the mountain. This makes the present eastern boundary of the reserve. This fence is the one above described as cornering at a point back of the "Half Way House."

With the completion in 1905 of the fence built by the Hutchinson Sugar Plantation Company, along the Kahuku boundary to meet the Hawaiian Agricultural Company's fence, the necessity for the fence running up the mountain through the forest from Puu Enuhe ceased. The wire was accordingly removed and this stretch of fence discontinued. The total length of forest fence now maintained by the Hawaiian Agricultural Company is therefore about twenty-six miles.

The credit of carrying the plan into operation and of building this forest fence belongs to Mr. Julian Monsarrat, manager of the Ranch Department of the Hawaiian Agricultural Company, to whom has also been entrusted the care of the reserve

since the fence was built. Following the completion of the fence, systematic driving and shooting got the wild cattle out of the forest and since that time no cattle have been allowed in the reserve.

The makai or south side of the proposed reserve adjoins the cane fields most of the way and is accordingly protected from cattle by the cane field fences or by natural barriers. In other situations short stretches of existing or proposed fence do or will complete the line.

WATER SUPPLY.

By reason of the protection afforded by its private forest reserve the Hawaiian Agricultural Company has by an extensive system of tunnels, ditches and flumes, been able to develop a reliable water supply, sufficient to meet the requirements of a large sugar plantation. Were it not for the water obtained from the forest and which depends for its continuance on the forest cover being permanently maintained on the mountain side, much of the agricultural land now under a high state of cultivation could only be used for grazing.

There is no question but that the Pahala Plantation has reaped the chief benefit from the development of the water supply which the reservation of the forest has made reliable, but it seems to me that the fact that such a development of natural resources would not have taken place save for the plantation, ought to be taken into account by the government and put to the credit of this company.

The indirect benefits which result to the Territory from the maintenance of such a forest reserve as this in Kau are sometimes lost sight of in the immediate gain enjoyed by the plantation, but it should not be forgotten that an increase in the acreage of cane land results in larger returns to the Territory, not only through direct taxation on the land itself and the crops grown thereon, but also through the increase of the minor and tributary business interests which depend for their existence on the success of the plantations. These industries, whether located in the neighborhood of the plantation or elsewhere in the Territory, yield in turn an increasing revenue through taxation as well as, and what is more important, going to make up the general prosperity of the Territory.

The same thing applies to what has been done in the development of water on the government lands back of Naalehu by the

Hutchinson Sugar Plantation Company, with the difference in this case that until recently the protection of the forest has not been carried out in so systematic a way on these lands as above Pahala.

If it is legally possible, it seems to me only just that these facts be considered in future dealings which the government may have with these companies.

While much has already been done toward developing water in Kau it would without doubt be possible to obtain some additional supplies by running flumes further back into the forest and by more tunnels. Just how much it is advisable to do can, of course, only be told after a careful study of the whole situation by competent persons. In the case of the Hutchinson Sugar Plantation Company, the most promising outlook seems to be on the fee simple lands of Hilea, but as this matter is outside the province of this report it need not be further discussed here.

GRAZING.

There is no grazing proposition in connection with the Kau Forest Reserve. Owing to the fact that it is possible to profitably cultivate cane at a higher elevation than on the windward side of the island, the forest line is much of the way identical with the upper edge of the cane fields, thus leaving no intervening stretch of open grazing land as is usual elsewhere in the Territory. Outside of the ranch departments maintained by the two large plantations there are no cattle interests in the section of Kau adjoining the proposed forest reserve, except the Kahuku Ranch. And as the entire boundary line between Kahuku and the Kau Forest Reserve is already fenced this ranch need not be here considered.

The ranch department on each plantation is subordinate to the main industry, and the cattle of each are for the most part confined to lands outside of the forest, not suitable for raising cane.

ELEVATIONS.

The highest profitable limit for raising sugar cane has been found to be about 2300 feet back of Naalehu. Above Pahala the line of flume laid out by Mr. J. S. Emerson in 1903 is considered the permanent upper limit of the cane fields, although not

all of the land below this line has as yet been brought under cultivation. This elevation is approximately 3000 feet.

Both at Naalehu and Pahala the upper land has been cultivated on contract by Japanese. As the crop at this elevation takes longer to mature the tendency is to pay more attention to intensive methods on the better lands below, rather than to take in a larger area above. Especially is this statement true of Naalehu, where all the available water that can be got is wanted for the irrigation of the lower level fields.

FUEL SUPPLY.

Special mention should be made of one area above Pahala, the so-called Mud Flow on the eastern side of "Wood Valley" on the government land of Ahulili, which I recommend be included in the reserve. The Mud Flow is a rough, rocky point projecting into the cane fields, the lower end of the area covered by a land slip. While the great bulk of the Kau Forest Reserve is to be considered as essentially a protection forest, such areas, being in a sense detached from the main forest and consequently exercising less influence on the drainage, could well be devoted to growing trees to supply the demand for timber and fuel always existing on the plantation below. This use of the land, under suitable restrictions and proper management, would in no way conflict with the main purpose of the reserve. It would rather be directly in line with the idea of the "preservation of the forest by wise use" that underlies the whole forest reserve system.

THE FOREST.

The forest in the proposed Kau Forest Reserve is largely made up of Koa and Ohia Lehua growing together, or forming pure stands, or in mixture with other less important trees. On the lower or makai side of the reserve, up to an elevation of perhaps 4000 feet, are found a number of trees in mixture with those just mentioned, none however being of commercial importance. Above this is a belt of Koa; a nearly if not quite pure stand of large sized trees. On the upper or mauka side of the reserve the Koa gradually gives place to Ohia Lehua, which in places forms a pure stand, for the most part of rather young trees. Koa and Mamani are found in detached groves further up the mountain on Kahuku in *kipukas* or pockets of good soil in the lava.

In the lower section of the reserve is a dense undergrowth. Perhaps nowhere in the Territory is there a finer example of the fern jungle, with its dense mass of tree and other high-growing species rising above a forest floor covered with the lower growing types and with bracken, than in the forest of Kapapala. Climbing vines like the *Ie-ie* are also in evidence, although the characteristic belt for this species is at a lower elevation.

Since the forest fence was completed ten years ago a wonderful difference has been noticed in the appearance of the forest. Even in the eighteen months elapsing between my two visits to Kapapala the growth of young trees had been sufficient to make impassable on horseback trails over which we rode in 1904. All around the outer edge of the reserve there is excellent reproduction, especially of *Ohia Lehua*, as well as, of course, a great increase in ferns and other undergrowth. A detailed examination of the reserve would yield much information of the greatest interest. In this report the description of the forest must be limited to this brief mention.

BOUNDARY.

The location of the boundary of the proposed Kau Forest Reserve was decided on after consultation on the ground with representatives of the two plantations and as fixed meets with the approval of those controlling the two companies. The boundary on the north and west sides is the natural one, as it is the dividing line between the government holdings and the large privately owned land of Kahuku, the greater part of which is without a forest cover. At the east end, while the forest actually extends somewhat further into Kapapala than the area now inclosed by the forest reserve boundary fence, it is believed that enough of the forest has been included to secure the objects for which this reserve is made. The section of Kapapala between the present reserve boundary fence and a line drawn northwest from Ainapo is good grazing land and all things considered I believe it should be so used.

The location of the lower line of the reserve has been the subject of special study on my part and as finally fixed I think it meets practically all of the requirements. Everywhere the line has been drawn with special reference to excluding from the reserve land suitable for agriculture. It is believed that this

has been successfully done, for under the existing economic conditions in Kau, including the lack of markets and the difficulty in transportation, it is not profitable to go further mauka than the present limit of cultivation.

Wherever possible advantage has been taken of natural boundaries, of existing fences, or of other limits already on the ground. Certain prominent points along the line have been marked with the sections of galvanized iron pipe constituting the lower part of forest reserve monuments, so that the upper sections of the monuments can now be put in place at any time. At other points on the line it may be well later to erect other and more conspicuous monuments, such as fern and rock ahus, but these details need not be discussed here.

DESCRIPTION.

A brief and popular description of the proposed boundary of the Kau Forest Reserve is as follows:

Starting on the Kahuku boundary at the northwest corner of the Puumakaa-Kiolakaa Homesteads and running along the mauka line of said homestead tract (already fenced) to the Waiohinu Springs; thence across the lands of Kahilipali 2, Kaunamano and Kioloku above the present (1906) mauka boundary of the cane fields to the northwest corner of Honuapo; thence across the lands of Hionaa, Hokukano, Kaalaiki and Hilea, to a point on the mauka side of Pakua Hill; thence to and following the upper line of the Ninole Homesteads across to a point on the Puu Enuhe Ridge; thence across the lands of Punaluu, Mohokea and Moaula above the cane fields to a point on the makai face of Puu Kaumaikiohu; thence to and following the flume line laid out by Mr. J. S. Emerson in 1903, to Kahaha Triangulation Station; thence to and around the cane fields at the head of the so-called Wood Valley; thence around and including the so-called Mud Flow on the eastern side of said valley; thence following the fences making the mauka line of the cane fields, and the Kapapala forest reserve fence to the point where it turns mauka back of and northwest from the Half Way House; thence following the Kapapala forest reserve fence mauka and to the westward to the southeast corner of Kahuku; thence in a general southwesterly and southerly direction along the Kahuku boundary to the initial point.

The gross area of the proposed Kau Forest Reserve as above outlined is approximately 75,500 acres.

LANDS INCLUDED.

The lands within the limits of the proposed Kau Forest Reserve which can, as a whole or in part, be set apart at this time as portions of the reserve are, in part, as follows:

(a) The lands now covered by Territorial Land Office Leases:

No.	Name.	Lessee.	Expiration.
106	Kapapala	Hawaiian Agricultural Co. . .	July 1, 1907
207	Moaula - Kopu- Makaka (Ma- uka)	do	... June 15, 1906
454	Mohokeya 1 & 2.	do	... June 4, 1907
429	Ninole - Wailua Forest	Hutchinson S. Plant. Co. . .	June 17, 1906
209	Kaalaiki	do	... Sept. 8, 1906

(b) The following unleased government lands, as a whole or in part:

	No. Lease.	Lease expired.
Kaauhuhuula Forest		
Kaalaiki (mauka)		
Kioloku		
Kawala - Kaunamano	420	Oct. 22, 1905
Hionaa - Kokukano	421	Jan. 10, 1906

There may be, probably are, other government lands not now under lease within the limits of the reserve, but the above list includes all the larger lands. In this connection reference may again be made to the other large government lands within the reserve on which the leases have yet many years to run: Puumakaa-Kiolakaa Forest, Lease No. 550, expires May 24, 1923; Waiohinu, Lease No. 151, April 1, 1914, and Kaalaala Makakupu Forest, Lease No. 555, July 1, 1924.

The more important privately owned lands within the Kau Forest Reserve are portions of Kahilipali 2, Hilea 1 (Hutchinson Sugar Plantation Company), Hilea 2 (Hutchinson Sugar Plantation Company in part), Punaluu and Paauau 2 (Bishop Estate), and Keaiwa.

On all of these lands it is the policy of the owner to protect the forest and carry out provisions looking to the maintenance of the area as a forest reserve.

RECOMMENDATIONS.

For the reasons above set forth, I therefore recommend that the Board adopt a resolution requesting the Acting Governor (1) to declare as the Kau Forest Reserve the area described above, and (2) to set apart as portions thereof all of the government lands lying within the said boundary, which are not now under lease or on which the existing leases are within two years of expiration.

I further recommend that whenever new leases are made, either for the lands adjoining the reserve or for the rights to prospect for and develop water within the reserve itself, clauses be inserted providing that the existing forest reserve boundary fences be maintained in good condition; and, whenever and wherever it may become necessary in the future to better protect the forest in localities not now fenced, that the lessee be required to build and maintain fences along such portions of the forest line.

If the lands continue to be used as at present such fencing will, except perhaps in a few cases, be unnecessary. A case in point is the section above Pahala where the line of the Emerson flume is taken as the boundary of the reserve. It is expected that this line will serve without needing to be fenced, but if in the future it should appear that the forest above is receding or being injured through lack of protection, the clause suggested would remedy the difficulty.

I would again call attention here to the suggestion made above that if it is possible under the law, some recognition should in my judgment be taken of the work done by the plantation interests in Kau in developing a water supply on government land, whereby it has been possible to bring considerable additional areas under a high state of cultivation, with corresponding financial returns.

ACKNOWLEDGMENTS.

In closing this report I wish to express my appreciation of the courtesies extended to me during my visits to Kau by Messrs. C. Wolters and Julian Monsarrat. To both these gentlemen, particularly to Mr. Monsarrat, I am indebted for assistance en-

abling me to get in touch with the local conditions as well as for valuable suggestions in regard thereto. I am also under obligations for information concerning Kau to the Hon. George C. Hewitt of Waiohinu, to Mr. John C. Searle of Hilo, and to Messrs. George H. Robertson and W. M. Giffard of Honolulu.

DESCRIPTION.

[The technical description of the boundary of the Kau Forest Reserve, prepared by Mr. George F. Wright of the Government Survey, is here omitted, as it is somewhat lengthy and will be published later in this magazine as a part of the proclamation creating the reserve.]

A public hearing to consider the setting apart of the Kau Forest Reserve has been called by Governor Carter for August 1, 1906, at the office of the Board of Agriculture and Forestry, in Honolulu.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry

PLANT DISEASES.

Southern California is to have a laboratory and experiment station for the study of diseases of plants. The financial support is to be furnished by the State that the work may be undertaken by the University of California as a part of the activities of its Department of Agriculture. The State Commission for the selection of a location for a pathological laboratory and experiment station—a board consisting of the Governor, President Benjamin Ide Wheeler, of the University, and Professor El J. Wickson, of the chair of agricultural practice in the University, is ready to receive proposals in regard to a site.

A DUTY.

By WILLIAM DUTCHER, President National Association of Audubon Societies. Office, 141 Broadway, New York.

And Let Fowl Multiply on the Earth.

Scarcely more than a generation ago the buffalo ranged the Western plains in countless herds, their numbers so great that no written estimate can be considered an exaggeration. Those who were fortunate enough to see one of these great hosts surging over the prairies little thought that in a few short years the buffalo would simply be a part of history. This noble beast was exterminated by man with a butchery so ignoble that it is sickening to dwell upon. The few dollars received for the hide was the incentive for this national disgrace. Almost at the same hour that the buffalo were vanishing, another of the wonders of this continent was also being ruthlessly and recklessly destroyed. Early writers tell of flocks of wild pigeons so large that the account of their numbers verges on the fabulous. Where are these countless winged hosts today? All gone. Why? Simply that a limited number of men without thought for the future might gather a few dollars by sacrificing millions upon millions of harmless and beautiful forms.

These two great assets of the people, of use and beauty, were improvidently wasted, because no public-spirited persons or association had the foresight or interest to protect them from the small band of selfish men who were the destroyers. The passing of the buffalo and wild pigeons is a forceful commentary on the indifference of the people of those days. Are the people of this generation showing any greater degree of interest in the wild life of the present day, much of which is rapidly decreasing in numbers? Few people realize how near the gulls and terns of our coasts came to extinction during the last decade, when fashion decreed that the snow-white plumage of those beautiful denizens of the beaches was necessary for millinery ornaments.

A simple proposition, in fact a duty, is now before the American people: Shall the sea-birds be preserved for future generations? Unfortunately, this class of birds gather in colonies during the breeding season, and are thus in greater danger than the wild bird that breeds singly. Plume-hunters can still kill them as in the past, when large colonies on our sea-board were destroyed

in a single season. Another method of extermination is egging; this is quite as fatal as killing the birds. There are yet small colonies of sea-birds which will serve as a nucleus, and may, by the greatest care and watchfulness, repopulate our country with these birds. If this desirable result is to be achieved, action must be taken at once by the public; it will not do to neglect the matter another season, or our children will say of us what we now say of our fathers regarding the buffalo and wild pigeon: "When you had the opportunity to save the sea-birds you did not do it, and we are deprived of a part of our heritage." The sea-birds can only be saved by placing at each colony, during the breeding season, an energetic, faithful and fearless warden, who will stand guard during the three months when the birds are brooding their eggs. The part the public can take in this great economic and esthetic movement is to supply the necessary funds. The National Association of Audubon Societies, an incorporated body, will do the administrative work.

During the present breeding season this Association has forty such wardens employed, but this number should be increased to at least three hundred men, in order to fully guard all of the remnants of colonies that once existed. The public are urged to join the National Association, the membership fee being five dollars a year, all of which sum is used in bird-protection work, as the executive officers of the Society contribute their services without compensation.

The seashore without the sea-birds would be like a garden without flowers or a landscape without trees. Unless active measures are taken now to prevent this disaster, it will surely come; then, reader, it will be too late to do more than grieve. This is not a duty you can delegate to your neighbor; it belongs to you. Will you help save the sea-birds, or will you see them vanish? To your descendants you are responsible.

*BY AUTHORITY NOTICES.**SPECIAL WARNING NOTICE.***FIRES TO CLEAR LAND—EWA BASIN, OAHU.**

Notice is hereby given that in accordance with Section 6 of Act 71 of the Session Laws of 1905, it is forbidden to start fires for the burning of brush, dry grass, etc., for a period of six (6) months from date, unless the written permission of the District Fire Warden has been first obtained, for all that portion of the District of Ewa, Island of Oahu, lying above the mauka boundaries of the cane fields of the Honolulu, Oahu and Ewa Sugar Plantations; and for that portion of the District of Waianae, Island of Oahu, lying between the Government Road from Pearl City to Waialua and the ridge of the Waianae Mountains.

The law reads "such fires shall not be started during a heavy wind or without sufficient help present to control the same, and the fire shall be watched by the person setting the same, or by competent agents of his, until put out." The District Fire Warden is Mr. W. F. Dillingham of Honolulu.

RALPH S. HOSMER,

Superintendent of Forestry and Chief Fire Warden.

Honolulu, March 17, 1906.

APPOINTMENT OF DISTRICT FIRE WARDENS.

Notice is hereby given that the following named gentlemen have been appointed Fire Wardens, under the provisions of Act 71 of the Session Laws of 1905, as follows:

DISTRICT FIRE WARDENS.

Mr. Hugo Haneberg, in and for the District of Kipahulu, Island of Maui.

Mr. Fred Meyer, in and for that portion of the District of Waianae, Island of Oahu, lying to the west of the summit ridge of the Waianae Hills.

Mr. H. J. Rhodes, in and for that portion of the Palolo Valley, District of Kona, Island of Oahu, lying mauka of the Waialae Road.

DEPUTY FIRE WARDEN.

Mr. David Haughs, Deputy Fire Warden at Large for the Territory of Hawaii.

C. S. HOLLOWAY,

Secretary, Board of Agriculture and Forestry.

Honolulu, March 23, 1906.

*SPECIAL WARNING NOTICE.***FIRES TO CLEAR LAND—WAIANAE VALLEY, OAHU.**

Notice is hereby given that in accordance with Section VI of Act 71 of the Sessions Laws of 1905, it is forbidden to start fires for the burning of brush, dry grass, etc., for a period of six (6) months from date, unless the written permission of the District Fire Warden has been first obtained, for that portion of the land of Waianae-kai, District of Waianae, Island of Oahu, lying above and mauka of the cane fields of the Waianae Plantation Company.

The law reads, "such fires shall not be started during a heavy wind or without sufficient help present to control the same, and the fire shall be watched by the person setting the same, or by competent agents of his, until put out." The District Fire Warden is Mr. Fred. Meyer of Waianae.

RALPH S. HOSMER,

Superintendent of Forestry and Chief Fire Warden.

Honolulu, March 23, 1906.

Notice is hereby given that Dr. J. Charlton Fitzgerald has been appointed Assistant Territorial Veterinarian for the Territory of Hawaii, under the Board of Agriculture and Forestry, according to the provisions of Act 82 of the Session Laws of 1905.

C. S. HOLLOWAY,

Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., April 2, 1906.

ACTING CHIEF FIRE WARDEN.

Notice is hereby given that during my temporary absence from the Territory, Mr. David Haughs, of the Division of Forestry, will be Acting Chief Fire Warden, with all the rights and powers appertaining to that position.

RALPH S. HOSMER,

Superintendent of Forestry and Chief Fire Warden.

Honolulu, T. H., April 7, 1906.

Notice is hereby given that permits for burning brush during the period of special fire danger, running six months from March 7, 1906, on the land of Wahiawa, District of Waialua, must now be obtained from Mr. Byron O. Clark, instead of Mr. A. M. Nowell.

DAVID HAUGHS,

Acting Superintendent of Forestry and Chief Fire Warden.

Honolulu, T. H., April 16, 1906.

PROCLAMATION OF FOREST RESERVE IN THE DISTRICT OF KONA, ISLAND OF HAWAII.

Under and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of the Territory of Hawaii, enacted April 25, 1903, and amended by Act 65 of the Session Laws of the Legislature of 1905, and of every other power me hereunto enabling, I, A. L. C. ATKINSON, Acting Governor of the Territory of Hawaii, having duly given the notice and held the heaing as in said Acts provided, do hereby approve as a Forest Reserve that certain piece of Govenment land on the western slope of Mt. Hualalai, on the Island of Hawaii, bounded on the South by the land of Puaa 1, on the West and North by the portion of Honuaula now covered by Lease No. 570 of the Territorial Land Office, and on the East by a line drawn from Puu Lae Koa to a point on the Puaa boundary a little below Puu Laalaau, in the District of Kona, Island of Hawaii, Territory of Hawaii; more particularly described as follows, viz:

Beginning at the Southeast corner of this Reserve, marked by a 3" pipe with a target on Top, marked F. R. T. H., and large ahu, on the boundary of Puaa 1 and Honuaula, true azimuth and distance from Government Trig. Station Puu Laalaau being $61^{\circ} 32' 17''$ distance 960.3 feet as shown on Government Survey Registered Map No. 1972 and running by true azimuths:

1. $61^{\circ} 32' 17''$ 4319.7 feet along land Puaa 1 to a 3" pipe and target marked F. R. T. H.;
2. $137^{\circ} 22' 15''$ 6871.9 feet along makai portion of Honuaula to a 3" pipe and target marked F. R. T. H.;
3. $223^{\circ} 00' 00''$ 3549.0 feet along remainder of Honuaula to + on stone, pipe with target marked F. R. T. H., and large ahu;
4. $312^{\circ} 50' 30''$ 8225.4 feet across mauka portion of Honuaula to the initial point. Area 665.0 Acres.

And I do hereby set apart as the Honuaula Forest Reserve that portion of the government land of Honuaula within the above described metes and bounds.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the Territory of Hawaii to be affixed.

Done at the Executive Building, in Honolulu, this 4th day of April, A. D. 1906.

A. L. C. ATKINSON,
Acting Governor of Hawaii.

Notice is hereby given that MR. WILLIAM G. OGG has been appointed District Fire Warden, in and for that portion of the District of Kau, Island of Hawaii, extending from the Puna District Line to and including the land of Punaluu, under the provisions of Act 71 of the Session Laws of 1905.

C. S. HOLLOWAY,
Secretary, Board of Agriculture and Forestry.
Honolulu, T. H., June 30th, 1906.

Notice is hereby given that **MR. W. C. WEEDON** has been appointed District Forester, in and for that portion of the District of Koolaula, extending from and including Heeia to the land of Kailua, Island of Oahu, under the provisions of Act 44 of the Sessions Laws of 1903.

C. S. HOLLOWAY,
Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., June 30, 1906.

Notice is hereby given that **MR. GEORGE CAMPBELL** has been appointed District Fire Warden in and for that portion of the District of Koolaula, extending from and including Heeia to the land of Kailua, Island of Oahu, under the provisions of Act 71 of the Sessions Laws of 1905.

C. S. HOLLOWAY,
Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., June 30, 1906.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Shower, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughe, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.
Report of the Commissioner of Agriculture and Forestry for 1902; 83 pp.
First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

*"On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

DIVISION OF FORESTRY.

*"Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1905.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

*Out of Print.

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DEAR SIR—I have received policy for \$20,000, issued to me in favor of my daughter, on the continuous installment plan.

My daughter is but eighteen years of age, and this contract guarantees to her \$1,000 at my death, and \$1,000 per annum as long as she lives, and to pay not less than twenty installments even if she should not live twenty years after my death. The reason I am so much pleased with this policy is based upon the fact that I fully realize, that no matter how much money I might leave my daughter at my death I would have no guarantee that it would last her through her entire lifetime.

The Company's liability under this form of contract might be \$50,000 or possibly \$70,000, if my daughter should live to be as old as some of her ancestors.

Yours very truly,

ISAAC W. MARSHALL.

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. III.

AUGUST, 1906

No. 8

One of the most important steps in the establishment of an Hawaiian export trade has recently taken place upon the coast. The newly incorporated Pacific Distributing Company of San Francisco has been founded for the exclusive handling of our island products, and being the first organization that has directed itself to this object its inception is worthy of more than passing interest. The new company will devote itself to the distribution upon the coast of Hawaiian sisal, coffee, pineapples, bananas and all other products except sugar. It will also incidentally foster a demand for such less known fruits as the mango and avocado pear by making their qualities more widely known among mainland consumers.

The new company commences its career under most favorable auspices, its vice-president being Mr. Wallace Alexander, the San Francisco manager of Messrs. Alexander and Baldwin, and its manager, Mr. Paxton Wright, the former San Francisco buyer for the Honolulu Company. Its headquarters are at 308 California street, San Francisco, and the company has already established connection throughout the West and is gradually extending its sphere towards the Atlantic coast. By this means the company will be able to acquaint itself of the local demand at each center and will thus be in a position to consign shipments with expedition to the points of most advantage. Hitherto one of the most frequent sources of loss to Hawaiian growers has been due to their inability, consequent upon the remoteness of their market, to direct their product to the point of greatest demand. The new company will be able to exactly gauge the requirement of each city, and will, in consequence, be able to apportion island products in such a way that good fruit will always realize good prices. It is expected that each sub-agent will notify the company of the requirements of his locality and will forward orders to be filled at the central office. If Hawaiian shippers and growers will also keep the company informed of their prospective consignments, expeditious and profitable sales will be

effected. It is to be hoped that the new company will meet with cordial coöperation on the part of Hawaiian growers, as by its means the possibilities of development of many of our industries will be greatly increased. With proper care Hawaii should become a great fruit-producing country and may in time be sending a regular supply of choice fruit to every city of importance in the Union. Already our pineapples are becoming well known and in a few seasons their superior qualities will create a demand for them which will be difficult to supply. With this should come prices to make the industry one of the most lucrative in the islands. Hawaiian bananas will in the same manner extend their sphere of demand throughout the whole of the Western States to the exclusion of the foreign fruit. Hawaiian mangoes and avocado pears, and many other fruits at present given little concern will follow in the wake, until the term "Hawaiian fruit" will be the standard of excellence. All this, however, cannot be achieved without well organized and persistent effort, but if the Pacific Distributing Company is alive to its opportunity, and if the Hawaiian producers give it due support, the resources of our islands should ere long be taxed to meet the demand for their fruit.

Mr. Dickson is now in the islands representing the interests of the Pacific Distributing Company. He will endeavor to enlist the support of local producers and in this the Forester wishes him all success.

It is often asserted that a certain fruit is the "king" or "queen" of all others, but an effort to exactly determine the order of merit of different fruits appears to be futile, as the question very largely resolves itself into one of personal appreciation. A recent writer in "Rural World" elevates the pomelo to the high honor of "finest fruit of the Orient." A well known agricultural publication takes exception to this opinion in the following terms: "The mango is not only more delicious but more popular and more extensively grown. The mongosteen is still more delicious, but not adapted to so wide a territory as either the mango or the pomelo." While agreeing with the last writer as to the popularity and more extensive cultivation of the mango, his unqualified statement that the fruit is more delicious than the pomelo cannot be taken as of more weight than expressing individual taste.

Fortunately no fruit possesses such pre-eminent qualities as to outdistance all rivals, but each species is particularly appropriate to fulfil individual uses, and what qualities one is deficient in another supplies. Of salad fruits who shall say that the tomato excells the avocado pear? Or even could an exact discrimination between the two be made, many elements intervene, such as those of comparative cost of production, length of season, extent of habitat, and suitability for export which would go far to determine general popularity and utility irrespective of mere flavor and quality. And so with all fruits. For drying and export, figs, dates, prunes and grapes are suited, yet to none of these is preference accorded, or one only would be grown to the exclusion of the others. For preserves and jams, strawberries, currants, apricots and plums each have their particular use. For table use pineapples, grapes, oranges and apples, each in turn are welcomed. And so throughout the entire category, the luscious peach, the exquisite lichi, the humble poha and the plebian watermelon each in turn is king, in some season, for some use, or to some individual, until a throne is even dedicated to the repellant durian. Of this last fruit, of which it is said that when one has overcome one's natural loathing one becomes passionately fond, Richard Semon writes: "In passing the market on my arrival at Java, I had been struck by an odd and disagreeable smell, reminding me at the same time of musk or onion and evoking the idea of something rotten and about to decay. In the hotels it is forbidden to introduce Durian or to eat it indoors." Wallace, the great naturalist, devotes several pages in his Malay Archipelago to a classic description of this "king of fruit," whose flavor he compares to "a rich butter-like custard, highly flavored with almonds and intermingled with which come wafts of flavor that call to mind cream-cheese, onion-sauce, brown sherry and other incongruities. To eat Durian is a new sensation, worth a voyage to the East to experience." There is said to be only one productive Durian tree in the islands, on Kauai, but if the enthusiasm of Wallace were more generally shared there would certainly be more. However, after the description of the eminent naturalist's "king" of fruit, we turn with gratitude to the more humble varieties of our own islands.

Attention is called to the proclamation of the Kau Forest Reserve, in the District of Kau, Island of Hawaii, that appears as a By Authority Notice on another page of this issue of the Forester.

Protecting, as this reserve does, the large watershed which supplies the needs of two great sugar plantations, the Kau Forest Reserve is an important one. The total area included within the limits of the Kau Forest Reserve is 65,850 acres. Of this area 59,618 acres is government land, of which 23,630 is under lease for a considerable period. The remainder, 35,988 acres, was actually set apart under the law when Governor Carter signed the proclamation creating the reserve, on August 2nd, 1906.

The owners of the private land within the reserve boundaries are heartily in favor of the creation of the reserve and will continue to manage their lands with reference to the objects for which the reserve is created. This was plainly brought out at the public hearing by representatives of the adjoining plantations, as was also the fact that one of the main objects of the Board in creating the reserve was to insure the continuance of the water supply which these plantations have done so much to develop. The legitimate development and proper use of the water from forest reserves, under water right leases issued by the Commissioner of Public Lands, is indeed one of the things which the forest reserve policy is intended to foster.

It will be recalled that the reports of the Superintendent of Forestry and of the Committee on Forestry, with the resolution adopted by the Board in regard to the Kau Reserve, have already appeared in the Forester, these documents having been published in the July, 1906, issue.

Experiments have lately been conducted to determine the possibilities of growing trees in the sand hills of Nebraska with results which encourage the belief that certain species may be grown with success in that region. It would seem to be expedient to investigate in this direction in these islands with a view to rendering productive and gradually to bring into cultivation the arid and shifting sand wastes which occur in various parts of the islands. Among the many advantages which would accrue in the course of a few years would be the conservation of mois-

ture and a general lessening of the extremely harsh temperature and excessive sunlight in the regions alluded to, which would gradually render them suitable for settlement. With the production of humus from tree growth and proper irrigation, a soil could be developed which would compare well with any other on the islands.

Any readers possessing copies of Mr. F. E. Conter's paper on "Sisal," which constitutes No. 4 of the Bulletins of the Hawaii Experiment Station, will confer a favor by forwarding them to the Forester. At present the issue is out of print and requests for copies have lately been received.

LADYBIRD v. WOOLLY APHIS.

On the 27th inst. I made another inspection of Mr. Muir's, Forest Hill, Mount Barker, to see the result which has attended the introduction of the ladybirds (*Leis Conformis*) introduced from Tasmania and liberated last year on the apple trees infested with woolly aphid. This orchard is one of the old-established ones of the district, and as a number of the apple trees were not on blight-proof stocks the pest made great headway when once introduced, and has been to the owner a source of worry and expense to keep it any way within bounds. At present, so satisfactorily has been the work of the ladybirds, there are only a very few apple trees with any trace of the woolly aphid, and these seem to have been missed by the ladybirds, although numbers were placed on them while these friendly insects were plentiful. Mr. Muir informs me that he intends to thoroughly spray immediately all infested trees, and destroy all trees not of blight-proof stocks, and hopes by this means to eradicate the pest, which has been reduced to such a small matter by the predaceous insects.

Numbers of another kind of ladybird, the *Oreus Australasiae*, indigenous to this country, are present in the orchard, and are doing good work on the Greedy Scale, the soft Brown Scale, and the Black Scale, but no trace, so far, of the internal parasites lately liberated for the two latter could be discovered.—Inspector David L. Breen in the Journal of Agriculture, W. A.

NOTES ON VEGETATION IN HONOLULU.

In a recent issue of *Park and Cemetery*, Charles Mulford Robinson, the civic beautifier, writes as follows :

The Hawaiian Islands, called "the Paradise of the Pacific," are coming more and more into public thought as a goal, as a dreamed-of haven, where, in the happy Sometime, one may go to find rest and beauty. And those things are found there. No one comes back without testifying that the dream is true; and year by year the tide of travel rises, more persons journey to Hawaii, realize the dream, and return to awaken a keener interest in those tranquil little islands—the farthest from the main land of all the inhabited islands of the world—where the broad Pacific is a sapphire sea.

If one could go with his eyes closed from Chicago to the Golden Gate, there certainly would be no sense of disappointment in the first impression made by the vegetation of the Hawaiian Islands after six days of sailing on the ocean. But all the way across the ocean one's eyes are very much open, and going as I did by way of Southern California, with frequent stops of several days at a time—and always saying to one's self, "Those palms are fine, but wait for Honolulu; these flowers are lovely, but think of the tropical blooms that we shall see; and these green fields, and hillsides verdant beneath the warm rains and brilliant sun of the California winter, are well in their way; but one must be temperate in admiration since the tropics are yet to be seen"—if one could go to Honolulu with none of this experience, there could be no disappointment. But after the roses of California, after the riot of flowers in park and garden, by wayside and in wood and field, which California offers to the winter traveler, the first views of the Hawaiian Islands and of Honolulu are not quite all one hoped.

The northern side of the island of Oahu, which is the first land seen at close range, is bleak and bare. Rocks jut into the sea, extinct volcanoes raise bleak sides in a gaunt and naked sternness that the tints of softening distance scarcely hide; and when the end of the island has been rounded, and skirting the southern shore one comes into the harbor, the land is yet so far away that in the larger features of the scene—in the beauty of peak and crater and of shadowy valley, and in the interest of the structures of the city—one quite forgets to notice the

cocoanut palms, which in pictures give the necessary touch of tropicalness.

In the first days there is recognized the beauty of the hills, but they are not quite as high as one had expected—not really mountains, on the island upon which is Honolulu; and one misses a wealth of garden flowers. There are no roses, a Japanese beetle having destroyed them all some years ago and successfully prevented their culture since, and the few flowers raised in gardens—as petunias, geraniums, and nasturtiums—seem no more flourishing than in the Eastern States. The banana is stunning but scraggly, and its big leaves have become familiar in California. The graceful pepper tree is not as beautiful here as on the coast; the orange and lemon trees are hardly as good, and for the common date and fan-leaved palm one had no need to cross two thousand miles of ocean. The whole effect is not, in short, the sum of many additions—California plus and plus—and in the first recognition of its algebraic character, that there are deductions to be made, one does feel a little pang of disappointment.

By degrees, however, one turns from subtractions to additions. There is here the wonderful royal palm, its great white trunk making it the most architectural of all God's trees, so that a row of the royal palms is a natural colonnade; there is the ever picturesque cocoanut palm, its long stem shooting off on grotesque curves, like a sky-rocket; there is the far-spreading, hospitable banyan of childhood's picture books; there is the *Poinciana regia*, or flame tree—in February a leafless skeleton rattling long and ugly seedpods, but to be gorgeous later on; there is the marvelous traveler's palm, the useful algaroba, and such vines and hedges! Waste and nearly stagnant ponds are covered with the lotus and with lilies, white and blue; and elsewhere rice fields paint the landscape with their peculiarly fresh green; and the sugar cane waves in the wind, like a corn field yellowish green. Up on the mountain—on Tantalus—one gets among the tree ferns and the wonderful giant vines, and knows at last that the north temperate zone is, indeed, far away.

As for the algaroba, it is much the commonest tree on the islands and much the most useful. But it is not a native, and the mother tree of all the countless brood can still be seen—with suitable label—on one of the principal streets of Hono-

lulu. The tree is suggestive of the pepper in appearance, but not as large, averaging about the size of our apple trees. It was brought to the island in 1837, from Australia, by a Roman Catholic priest, who in that act did as much for the people of the Hawaiian Islands—speaking in a material sense—as perhaps any man who ever went there. The bean is good for cattle and so liked by them that one may see “pastures” without a blade of grass and looking like orchards, and the tree is invaluable as firewood. It has shallow roots, so that one can never tell when a strong wind may lay it low; but it is a rapid grower, and already woods all the islands, while a man need not have a great many trees in his back yard to supply his rather frugal fire needs throughout the year, and yet at the year’s end have as good trees as he had at its beginning!

The wonderful flowering vines are the *Bougainvillæa* and the *Bignonia venusta*—the latter a mass of orange colored bloom—throwing its royal mantle of Holland clear over the roofs of houses, and the former an equally wonderful mass of cerise, or much more rarely of scarlet, flowers. The *Bougainvillæa* is a great favorite, as it well may be, but its commoner color so fights with the color of every other flower in the garden that if one is particular about effect one must plan to set it in plain green. But it is sufficiently beautiful in itself; and when, in walking or driving about Honolulu, one comes on the great splashes of one or the other of these vines—as one very frequently does—any lack of flowers as compared with California is forgotten.

The most familiar hedge is the hibiscus, which is found in all parts of the city. Almost all the time it is thickly covered with large flowers of a bright red, like very wide open red tulips. These lie on the top and sides of the hedge, showing strongly against the green, as if they were pinned there for temporary effect. This also adds much to the floral show of the island. On the stone walls, of which there are a considerable number, the night-blooming cereus is a common hedge or cover. It is said that in front of Oahu College the flowers of the plants number some thousands at a time. In the gardens the most common decorative plant is the croton, which comes in many varieties.

There is little good landscape work. The gospel of the open lawn with massed border planting seemed hardly to be known.

In a few cases a tropical jungle had been attempted; in many more there was an unhealthfully thick planting that was without beauty, or seeming purpose, while in most there were lawns badly "spotted" with palms and other plants. As to the thick planting, the story was that things were put in when small and that when they grew large, as everything soon does there, the owners could not bear to pull them up—which is a probable explanation, but a poor excuse.

There are two "squares" which ought to be ornamental, and of which only one can by the kindest of interpretations be called so; and there is a large park that in most respects is worse than any of the private gardens. But the superintendent is now doing what he can for it, with meager appropriations, and the people are thoroughly aroused, have ideals, and give promise of so nearly realizing them that the conditions I have described must soon be an old story, of which the truth has passed.

In fact, I do not know that I have ever been in a community more thoroughly saturated with "improvement" zeal, and alive with "improvement" effort. There are multitudes of neighborhood clubs—unfortunately more than one, sometimes, on a single street; there is a Central Improvement Committee, which is designed to bring the activity of the various societies into association and harmony—and whose suggestion it was that the government should secure from me a general plan, for which and on which all might work for a better and lovelier Honolulu; and there is an Advisory Committee, made up of local experts in gardening, horticulture and forestry, to whom the technical questions are supposed to be referred. Thus is the movement not only far reaching, but well organized, and it has the support of all classes of citizens and of the government, local and territorial. The very vacant lots, in case after case, have well kept lawns. Honolulu, in the once far-away Sandwich Islands, might give points to most American towns even today in its manifestation of the spirit of town improvement.

Little by little, as one stays on the island—even though one's thoughts be busy with other matters—the charm of the place, its tranquility, its beauty, weave a spell upon one. With little that is awe-inspiring or grand, and nothing that is colossal, peace and loveliness dwell there, pervade all that one sees.

PERSONALIA.

Mr. Charles S. Judd of Honolulu, a student of the class of 1907 in the Yale Forest School, has been appointed Special Forest Agent in the Division of Forestry for a temporary period during the summer.

Mr. Judd will have charge of an investigation of the planted forest on the lands of the Lihue Plantation Company and of Grove Farm at Lihue, Kauai. Careful measurements will be made of the trees on sample areas in stands of varying age to secure data as to the growth in size and height of the trees growing thereon. The figures obtained will serve as the basis for a report on forest planting in the Territory, which it is expected will be issued during the coming year as a Bulletin of the Division of Forestry. The data obtained at Lihue will permit the preparation of yield and volume tables showing what owners of land generally similar in situation, soil and aspect to that at Lihue may expect from forest plantations.

The employment of Mr. Judd to take charge of this investigation is in line with the usage of the United States Forest Service in taking on forest school students to assist in certain of its field work.

Mr. George De Canavarro, the son of Senhor A. S. Canavarro of Honolulu, who is studying forestry at the University of Minnesota, has been appointed a Forest Guard on the Minnesota Natural Forest Reserve, under the U. S. Forest Service.

Mr. A. J. Boyd, editor of the Queensland Agricultural Journal, in a recent letter writes: "I take this opportunity of letting you know how much I appreciate the Hawaiian Forester. I hope to see it grow to double the size ere long."

Mr. F. W. Dickson, who arrived on the S. S. *Siberia* last month, will spend some weeks in the islands in the interest of the Pacific Distributing Company of San Francisco, which has lately been organized to handle Hawaiian fruits and agricultural products. During his stay here Mr. Dickson will visit Maui and Hawaii and the chief agricultural districts of the different islands.

In a recent letter from the Rev. William M. Jefferies is included the prospectus of a series of lectures which he is about to deliver. In a two years' tour of the world Dr. Jefferies visited Europe, Egypt, Arabia, India, Ceylon, the Straits Settlements, China, Korea and Japan, and finally spent some months in Hawaii. He is therefore peculiarly fitted to pass judgment upon the islands and to compare them with other countries. He does so in the following terms:

"When the world awakens to the realization of the fact that in Hawaii fifteen tons of sugar can be raised on an acre, as compared with two tons in Louisiana; that this most charming spot on all the earth—where religion and education unite to produce a most charming social life—has palatial hotels that are unsurpassed by those to be found anywhere; that its volcanoes, extinct and active, are the greatest on the earth; that the opening of the Panama Canal will make Hawaii the 'Port of Call' between the Orient and the Occident; then it will flock—as doves to the windows—to these romantic islands, where the sun shines every day of the year, and where health and happiness combine with pecuniary profits to make the life there singularly ideal."

THE SOY BEAN.

The Soy bean is cultivated extensively in China and Japan and is used for food in the form either of a sauce, or the seeds are compressed into a paste or cake. Soy is said to enter largely into the composition of many American and European sauces. After the preparation of the sauce the exhausted cake mass supplies an excellent food for cattle. The plant is used largely for fodder and is also valuable as a green manure. The cultivation of the Soy bean is simple and is remarkable for the short time in which it matures its crop. The plants are said to blossom when a month old, and the crop is picked in from six to eight weeks after the seeds are sown. In view of the enormous quantities of Soy imported into Hawaii there seems to be a profitable field for the growth of the bean in these islands.

RECENT PUBLICATIONS.

BULLETIN NO. 12.

The Mango in Hawaii, by J. E. Higgins, *Horticulturist Hawaii Agr. Exp. Station. Washington, 1906.* This bulletin is one of the most interesting and instructive to general readers that we have read from the pen of Mr. Higgins. The mango is often called "the king of fruits," but while none who have had the pleasure of tasting the more choice varieties of this delicious tropic product, will deny its high claim for prominence, a distinction such as that conferred by the term we have quoted, seems more deserved by one or other of those less pretentious fruits which have by their simple qualities and utility earned for themselves a recognized position in our domestic economy. As is well known the mango is not indigenous to Hawaii, although its congener, the Wi (*Spondias dulcis*), holds a place among Polynesian flora. Other nearly allied trees to the mango common in Honolulu are the Cashew nut and the pepper tree. The cultivation of the mango has been carried on in India from the earliest times, but its introduction here was probably from Mexico, although more recent importations have been made from many parts of the world. There has recently been exhibited in a Honolulu store, fruit from the reputed first mango tree which was planted here. The quality of the mango fruit grown in Hawaii is generally mediocre, and as there are so many high class varieties of delicious flavor which bear about the same relation in quality as that borne by a good apple to the "crab," it is certainly well worth while to endeavor either to replace our inferior trees by those of better quality or to use our old stock for careful grafting. This is the more important when it is remembered that as far as the great majority of our population is concerned the mango in Hawaii is indeed "king." Mr. Higgins in his bulletin, urges the extensive cultivation of mangoes for export to the mainland where an almost unlimited market awaits exploitation. The whole subject of propagation, grafting, transplanting and general cultivation are dealt with at length, as well as directions for picking and marketing the fruit. Directions are also given to allow the novice to eat the mango, and attention is directed to the different uses of the fruit, in which connection receipts are given for the manufacture of chutney, marm-

lade and jelly. Finally a detailed list of forty-two of the best known varieties are given, several of which are referred to in Dr. Gifford's Florida Notes, which we published last month. The bulletin contains ten full page plates, and we cordially recommend it for general reading throughout the Territory.

BULLETIN NO. 13.

The Composition of Some Hawaiian Feeding Stuffs, by Edmund C. Shorey, Chemist, Hawaii Agricultural Experiment Station. Washington, 1906. In response to frequent requests received by the Experiment Station requesting the composition of Hawaiian grown feeding stuffs, Mr. Shorey has prepared this bulletin. With regard to the commonly cultivated plants of which analyses are available, the question arose as to how far the average analyses of plants grown elsewhere represent the composition of Hawaiian grown crops. In other words, it was desirable to ascertain whether our climate, soil and methods of cultivation exercise any special effect upon the composition of the crops. To answer this question and also supply data, a series of analyses has been conducted as part of the regular routine work of the chemical laboratory of the station. The first results of these experiments is published in the bulletin. The first group of feed stuffs to be treated were the various saccharine and non-saccharine sorghums, including sorghum, sugar-cane tops, millet and Kaffir corn. Of wild and cultivated grasses thirteen varieties are enumerated as having been subjected to analyses, including Guinea grass (*Panicum jumentorum*), Para grass (*Panicum molle*), and Water grass (*Paspalum dilatatum*), Barnyard grass (*Panicum crus-galli*), Manienie or Bermuda grass (*Capriola dactylon*), Hilo grass (*Paspalum conjugatum*), Buffalo grass (*Stenotaphrum secundatum*), Pilipiliula (*Chrysopogon aciculatus*), Kukaipua (*Syntherisma sanguinalis*), Pili grass (*Heteropogon contortus*) and Yard grass (*Eleusine indica*).

Among Leguminous forage crops were treated Alfalfa, Wild Cowpea, Cowpea and Spanish clover and the following forage weeds were also examined: Pigweed, Pualele or sow thistle (*Sonchus oleraceus*), Honohono (*Commelina nudiflora*) and Ki (*bidens pilosa*). Most of the weeds analyzed were very succulent, that is, they contained a very small proportion of nutritive

material and a large proportion of water. The ki, however, differed in this respect, the water being fairly low and the proportion of nutritive material fairly high.

Cactus, or prickly pear, banana tops and butts, sweet potato tops, ti leaves, kiawe beans and root crops were also analyzed, besides many commercial products. A fact of special significance shown by the experiments shows that Hawaiian feeding stuffs, especially grasses are, as a rule, deficient in lime, which food constituent, should be supplied by leguminous plants or other means.

"Hals suggests that a deficiency in lime may be remedied by adding suitable mineral matter to the ration, precipitated dibasic calcium phosphate being considered superior for the purpose to bone meal, bone ash, or similar very indigestible materials."

The Influence of Stripping on the Fields of Cane Sugar, by C. F. Eckart. Bulletin No. 16, Division of Agriculture and Chemistry, Hawaiian Sugar Planters' Association. Under the above heading Mr. C. F. Eckart presents the data obtained by a series of painstaking tests conducted at the Experiment Station, which go to show that under certain conditions much sugar is annually lost by plantations practicing stripping, although stress is laid upon the fact that the question is a local one and that in order to demonstrate the practical utility of the investigations careful field tests must be first made upon the various plantations. As introduction to his subject, Mr. Eckart writes:

"Probably no subject relating to the field operation of the sugar industry in these islands has been more freely discussed by plantation managers than that of stripping, or the removal of dried leaves from the cane stalk. Widely divergent opinions are held as to the economy of this expensive practice, and owing to the radically different conditions under which cane is grown in this country, it is natural that the experience of some plantations, in this particular, has not always been in conformance with that of others. The question is largely a local one and the profits or losses from stripping are determined by the conditions under which the operation is performed. These controlling factors have, in recent years, become so involved through the ravages wrought by the leaf hopper pest and fungus diseases that the most careful judgment is now required to determine whether or not the practice may be employed to advantage in any given instance."

The Luquillo Forest Reserve, Porto Rico, by John C. Gifford, D. Oec. Agent, Bureau of Forestry, Washington, 1905, 8 vo., 51 pages, 8 plates.

This publication, which constitutes Bulletin No. 54, of the Bureau of Forestry, U. S. Department of Agriculture, has been received from Dr. Gifford and is interesting to Hawaiian readers on account of the comparison which it suggests between the forestry conditions existing in Porto Rico and our own islands. Speaking of the animal life in the former, the writer says:

"Injurious animal life, in fact animal life of any kind, is strikingly absent. One can spend a long time in the reserves without seeing any wild animals except small lizards, tree toads and a very few birds. Even insects, such as butterflies, are very scarce. The absence of many forms of animal life is often accountable for by the presence of the mongoose, which was introduced to exterminate rats on sugar plantations, and he has succeeded in exterminating most of the animals within reach, but is so wary that he is rarely seen."

Trade winds, as in Hawaii, blow throughout most of the year, and being laden with moisture, allow the sheltered portion of the reserve to be clothed with luxuriant vegetation. As a rule, rain does not fall continuously, except during severe storms, but as a rule drenching showers alternate with bright sunshine. These showers are usually very local and one can often watch and hear them in the distance. So sudden and heavy are the downpours in the mountains at times that a quiet brook becomes a raging torrent and subsides again to its normal condition in a couple of hours. There is less rain in the daytime than at night. Parts of the island are drenched with water most of the time and other parts within a half a day's ride are dependent upon irrigation. In parts of the island the rainy and dry seasons are pronounced, but on the reserve it is rainy throughout the year.

The highest temperature recorded in Porto Rico for 1902 was 98°, and the lowest 60°. The annual mean temperature for the year was 77.8°.

The density of the jungle, the abundance of worthless weeds, the absence of roads and trails, the frequent rains which soften the soil and render the mountain paths impassable, all add to the difficulty of work upon the reserve. The heat and rain interfere

to such an extent that with the best workers only a small part of which is accomplished in more salubrious climates can be expected. The water, however, is good and the region is free from mosquitoes, flies and other obnoxious insects. Danger to health lies in three sources, exposure to the sun, lack of proper food, and most serious of all, the impossibility of keeping one's clothing dry. In the wake of this last come inevitably malarial fevers, dengue and tropical dysentery.

Successful cultivation of coffee, fruits, cacao and similar products is dependent upon windbreaks, and only in sheltered sites is luxuriant tree growth developed. Hurricanes are experienced during August and October when the eastern trades become uncertain.

In those parts of Porto Rico which are free from excessive winds, and where the rainfall is plentiful and uniform, a heavy growth of timber is developed. The most prominent characteristic of the Luquillo forest is its diversity and the great number of little-known species in mixture. It is rare to find trees of the same species in considerable number together. The tree which is most gregarious in habit is the mountain palm (*Acrista monticola*, Cook). This tree is of no commercial value whatever, and has complete control of extensive areas. It grows thickly and produces an immense amount of seed which germinates quickly on the wet ground. In looking down upon the forest it appears like a sea of palms covered with islands of dark-leaved hardwoods. The mountain palm is a true forest weed. With its tall stem and broad leaves it presents a beautiful and tropical appearance, but if the reserve is ever to be of value, the extinction of the palm will be necessary.

Excluding the palm and brush areas, there is left a belt of mixed timber close to the lines of the coffee plantations, in which are found quantities of the best timber, but the utility of these is as yet undeveloped.

The industries of the reserve are almost entirely agricultural. Except for sugar, hides and coffee, which are exported, the region barely yields enough to support the native population, which subsists mainly on bananas, yautia, rice and other similar products raised in little patches on hillsides. When the fertility of one patch is exhausted, another is cleared and the old one allowed to be taken possession of by weeds, brush and grass.

A few people are engaged in lumbering. The trees are felled

and cut into short logs with crosscut saws. The timber is sawed into boards in the woods on a rough staging built of poles, tied together with withes. A sidehill is chosen for the operation, which is the same as the old pit sawing, still practiced in modified form throughout the world where timber is not very plentiful and labor is cheap. The system in Porto Rico is slightly different from that generally followed, in that the log is first squared and then the boards are cut, but not completely severed. The log is then hauled down slippery paths and through much mud until a road is reached. The hauling is accomplished by oxen, yoked by their horns, to which yoke the timber is chained. Stakes driven along the paths prevent the stick from sliding down hill in turning sharp curves. The big-horned oxen, with heads to the ground, groaning and often bleeding from the goads, plunge recklessly down the narrow paths. A man behind yells in warning and the traveler must often turn back until he finds a place wide enough for them to pass. Sometimes the timber is cut into boards and carried on the backs of men.

In the manufacture of fine cabinet work the native carpenter is an adept. It is only for this purpose that these timbers can be profitably used, since for ordinary construction imported lumber can be sold more cheaply in the local market. A trade in wood carving similar to that of Sorreto in Italy could be easily developed in Porto Rico and would furnish remunerative labor to the poor natives.

The sugar and fruit industries of the reserve are extending, but coffee lands are neglected, unprofitable and rapidly deteriorating. Much of it is going back to forest, much is being sold for taxes and probably much more will be sold before conditions improve. Coffee was at one time the principal product of the island. Today it hardly pays the picking.

Cacao is growing well in the Luquillo region. It requires conditions similar to coffee and is also a semi-forest crop. Cocoanuts are shipped in considerable quantities in sailing vessels and there is also a small copra factory.

One grower near Orlando picked 750 boxes of grapefruit from 250 trees last season and sold them for \$3,000.—*The Florida Agriculturist*.

PROTECTION OF FORESTS FROM FIRE.

Of all the dangers to which a forest plantation is exposed, fire is the greatest. Insects, fungi, and natural factors,—such as storms and droughts,—frequently occasion losses among the young plants. But the damage done usually extends over only a small portion of the area planted and can be repaired at comparatively little expense.

A forest fire, however, if it once gains headway, may sweep over the entire plantation, entailing a total loss. This fire hazard of course is greatest while the plants are young, but is present in decreasing amount throughout the life of the forest. Every land-owner, before establishing a plantation, should seriously consider the problem of fire protection. If protection can be secured at a reasonable cost, the plantation may be established; but if protection from fire can be obtained only through large expenditures, the idea of planting should be abandoned.

As a matter of fact, fire protection in a majority of cases can be secured very cheaply, when once the attempt to do so is made.

Efforts to protect a plantation from fire must vary in individual cases, but will be along two main lines, as follows:

- (a) Toward the construction of fire lines.
- (b) Toward patrol of the plantation.

By a fire line is meant a narrow strip of land, a few feet wide, bordering the area to be protected, and kept clear of all inflammable material. A roadway or else a ploughed strip make the best kind of fire lines. Where the ground cannot be ploughed, all dead branches and leaves should be removed and the fire line burned over occasionally to keep down the grass. The ordinary surface fire will not pass such a fire line, which can be constructed for \$10 a mile as the maximum cost.

Where the area to be protected is of considerable extent, it may be wise to have a man keep watch of, or patrol, the plantation during the dry seasons in each year. Unless the tract contains several hundred acres or more the cost of such a patrol would be excessive, where paid for outright. But small land-owners are often so situated that they can keep watch of their plantations themselves, without great inconvenience, thus obtaining fire protection at small cost. When the owner has become convinced that he can secure adequate fire protection for his prospective forest plantation, and not until then, is he ready to think seriously of planting.—The Massachusetts Tree Planter.

REPORT ON HORTICULTURAL QUARANTINE INSPECTION WORK.

Honolulu, T. H., August 8, 1906.

To the Honorable

Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen: Since my last report to you at your meeting June 20th last, I have to report the following synopsis of work done in the Entomological Division:

ARRIVALS.

During that time fifty-eight (58) steamships and sailing vessels have entered the port of Honolulu from outside the Territory. We found the following freight, twelve thousand eight hundred and fifty-seven (12,857) packages of fruits and vegetables; fifteen (15) packages of plants and twenty-nine (29) packages of plants and seeds by mail.

MISUNDERSTANDING REGARDING PLANT AND FRUIT FUMIGATION.

We are frequently accosted by parties that have received plants—especially by mail—"that their plants were killed by fumigation," whereas the facts are no plants are even injured by that treatment nowadays, as we fully understand the amount of hydrocyanic acid gas each species will stand and the time exposure required to destroy the various class of insects to be treated. Parties receiving such plants, seldom, or never take into consideration that their plants have been in transit from eight to twenty days, under conditions other than natural. In most cases they are shriveled and dried up and such soft wooded plants as geranium, heliotrope, petunia, etc., are packed tight with all their foliage to heat and rot and when they arrive are in anything but growing condition, and instead of being the fault of the inspectors and fumigation, we frequently are the means of rescuing plants from death by applying a little moisture to the roots of those that are very dry, or by removing the rotted leaves and stems of others. The postmaster, or one of his assistant's attention is always called to such packages when they arrive in bad condition.

CHINESE BENEFICIAL INSECTS.

On July 6th I addressed a letter to the Honorable Amos P. Wilder, U. S. Consul General at Hongkong, China, informing him that we would send four small orange trees in tubs by a subsequent steamer to his care with the request that he kindly turn the trees over to an American horticulturist to care for them until called for by either Mr. George Compere, beneficial insect collector of California, or Mr. F. Muir, one of the staff of entomologists of the Hawaiian Sugar Planters' Association, both of whom are expected to soon visit China in search of beneficial insects. I had personally instructed both gentlemen regarding the object of sending the trees infested with certain scale insects that we desire stocked with their natural enemies or checks that we know exist in China, consisting of very minute Chalcid, Hymenopterous flies. On July 12th the trees were forwarded to Hongkong per S. S. "Siberia," freight charges prepaid, and further instructions sent to Consul General Wilder and George Compere. In a former letter to Mr. Wilder I directed that no fumigation of the trees be allowed in China, as it was necessary that the various scale insects reach there alive. Mr. Haughs and Mr. Austin assisted in packing the trees for their long voyage.

ECONOMIC PLANTS FROM WASHINGTON, D. C.

Four large cases of Cacao (370) plants and six small Mango trees arrived on July 6th per S. S. "Alameda" from the Department of Agriculture, Washington, D. C., via San Francisco. The Cacao plants had been thoroughly treated with Bordeaux mixture and on the Mango trees we found a few very small "Florida red scale" (*Chrysomphalus ficus*) which upon microscopic examination we found were dead—evidently having been fumigated before shipment.

SOIL BALLAST CONDEMNED.

On Sunday, July 15th, the large four-masted American iron ship "Atlas" arrived from Yokohama with a cargo of soil ballast containing vegetable matter and roots. As the laws of the Territory and your regulations positively prohibit the landing of such material we notified Captain Amberman and the agents of

the Standard Oil Company, to whom the "Atlas" belongs, that the ship would have to discharge her ballast outside the harbor into the ocean. The captain was afraid that his ship would "turn turtle" when the ballast was removed. We advised that sufficient sugar be taken on board to stiffen her as that will form part of her cargo on her voyage to the mainland. The ship was towed out and discharged her cargo at an expense of six hundred and forty-five (\$645.00) dollars. The time occupied in the work was seven days.

ALLOWABLE BALLAST.

This Territory has suffered enough loss from insect pests and plant diseases in the past without taking such risks of adding other species to the list. There is no restriction to sand or rock ballast. Covert hints and threats have been freely circulated along the water front that the Standard Oil Company would commence legal proceedings against the Territory to recover supposed damages. The passage of a law holding parties liable for damages that occur from introduced pests or diseases into a section would have a wholesome effect upon some importers that labor under the belief that the United States is a free country and they can do as they please.

FEDERAL PROTECTION.

The Federal Government passes laws against the possible introduction of plague, cholera, yellow fever and other diseases; and the States and Territories are left to protect themselves against the possible introduction of pests or diseases that have caused losses of millions of dollars to the products of their soils, vide "Gipsy moth" in Massachusetts, "Cotton boll weevil" in the South, and the "San Jose scale" that was introduced into California and is now spread over the States and into Canada, besides scores of other pests that have been introduced into the country.

IMPORTS FROM CUBA.

On July 18th the S. S. "Sierra" arrived from San Francisco having on board two (2) boxes of plants from Cuba. Some small seedling palm trees showed traces of that disgusting introduced pest (*Pseudococcus nipae*) of the avocado pear tree, guava and

other Island products. This proves the existence of that scale in Cuba, and as the scales were not very plentiful it is possibly preyed upon by parasites or predacious insects and an effort will be made to ascertain the cause of its scarcity. The soil in which the seedling palms were packed was dumped into the water.

INFESTED ORANGES.

Twenty-four (24) boxes of oranges infested with three species of scale insects ex S. S. "Sierra" were deported. The grower did not think enough of his product to put his name or locality on his boxes, only the commission merchant's name appearing in small letters upon the end of each box.

CONDEMNED APPLES.

Ten (10) boxes of apples infested with Codlin moth larvae, "brown spot fungus" and "apple scab" that came on the same steamer were destroyed by fire. The grower of this fruit was evidently also ashamed of his product, for the boxes were not stenciled or marked with the grower's name or address. Had the fruit been free from insect pests and plant diseases this—according to the laws of this Territory—would have been sufficient grounds to have refused the entry of the fruit. This is a valuable point, for we can determine promptly if the fruit is liable to be infested with maggots of fruit flies or is from a district subject to them.

NEW FRUIT TREES.

We have on various steamers for Brisbane, Queensland, forwarded packages of *Ceroplastes rubens* to Mr. L. G. Corrie, President of the Queensland Acclimatization Society in hope of establishing the parasite that keeps that scale insect in check in this Territory. Mr. Corrie has very kindly sent us, freight prepaid, three new mandarin orange trees that originated there and is considered to be the finest mandarin orange in the world. One of the trees will be planted on the uplands of Tantalus, one in Nuuanu Valley and the other in the vicinity of Honolulu. This will thoroughly test their adaptability to the various elevations. Buds will be taken later for general distribution. A variety of persimmon and a variety of mango called "Rose," three small palm trees and a scarlet Ipomea, with the exception of the latter,

all were in fairly good condition, but had dropped their leaves, except the palms.

FLY PARASITES.

In my report to you on May 16th I referred to the receipt of two jars of possible horn fly parasites that we received from Prof. Koebele, which he collected near the Mexican border in Arizona. The insects were turned over to Mr. Kotinsky for propagation. He placed the parasites in breeding jars containing "horn fly" and other dung fly maggots and pupae. On June 4th the first local bred parasites issued. A second generation was again bred out on June 29th and on July 25th he had the fly parasites in such numbers that they were sent out to the principle cattle men on the various Islands and liberated by him in various desirable districts of this Island.

"TORPEDO FLY EGG" PARASITES.

It gives me pleasure to again report the discovery of new districts where this very minute but valuable imported parasite has established itself, and Mr. Kotinsky has distributed further colonies to other districts.

DARK ROOM.

The former fumigating house connected with this station and located on the grounds has not been used for that purpose since the construction of other rooms for that work on the docks and is now being converted into an up-to-date photographic "dark room" where Mr. Kotinsky will develop his plates of entomological subjects, etc. This room will be used by all the divisions of your Board for photographic development.

Respectfully submitted,

(Signed) ALEXANDER CRAW,
Superintendent of Entomology and Inspector.

BY AUTHORITY.

PROCLAMATION OF FOREST RESERVE IN THE DISTRICT
OF KAU, ISLAND OF HAWAII.

UNDER and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of the Territory of Hawaii, enacted April 25, 1903, and amended by Act 65 of the Session Laws of the Legislature of 1905, and of every other power me hereunto enabling, I, GEORGE R. CARTER, Governor of the Territory of Hawaii, having duly given the notice and held the hearing as in said Acts provided, do hereby approve as a Forest Reserve the lands in the Kau District, Island of Hawaii, lying on the lower Southern slope of Mauna Loa, bounded on the West and North by the land of Kahuku, on the East by the forest fence erected within the lands of Kapapala by the Hawaiian Agricultural Company, and on the South by a line drawn across the various lands back of the Pahala and Hutchinson plantations, at approximately the lower edge of the existing forest, and containing an approximate area of 65,850 acres, in the District of Kau, Island of Hawaii, Territory of Hawaii, more particularly described as follows, viz:

Beginning at a Forest Reserve Monument in the woods at "Puulepo," at the North corner of Kiolokaa—Keaa Homestead Lot 3, on the boundary between Waiohinu and Kahilipalinui, the true azimuth and distance to Government Survey Trig. Station "Haao" being $281^{\circ} 23'$, 4383.5 feet, as shown on Government Survey Registered Map No. 2361, and running:

First along the Kiolokaa-Keaa Homesteads as by survey of Messrs. Emerson and Harvey:

1. S. $82^{\circ} 17'$ W. true 2965 feet along Homestead Lot 3 and across reservation for 40 foot road to "+" on pahoeohoe;

2. S. $82^{\circ} 32'$ W. true 2219 feet along Homestead Lot 4 to "[triangle with dot in center]" on solid rock and ahu at Kaiuwai at a point from which "Puu o Lokuana" Trig. Station is S. $59^{\circ} 34\frac{1}{2}'$ w. 13,870 feet and "Kaa-na-manu" Trig. Station is S. $30^{\circ} 6\frac{3}{4}'$ W. 4682 feet;

3. S. $77^{\circ} 8'$ W. true 1800 feet along the same to "[triangle with dot in center]" on solid rock and ahu on a hill at Ohia-lele;

4. S. $89^{\circ} 33'$ W. true 2408 feet along Homestead Lots 4 and 8 to "[triangle with dot in center]" on solid rock and ahu on rocky hillock at Kaleleao;

5. S. $68^{\circ} 57'$ W. true 2975 feet along Homestead Lot 8 to a "+" on stone and ahu at the base of a lofty ohia tree at Waia-Kooloa, whose co-ordinates referred to "Akihi" are 3293 feet South and 4583 feet East;

Thence following the boundary of Kahuku as per bearings and distances taken from Boundary Certificate No. 85 to points marked on the ground by Messrs. Emerson and Harvey for the Government Survey as follows:

6. N. $20^{\circ} 30'$ W. mag. 2706 feet to "+" on stone and ahu in woods;

7. N. $38^{\circ} 00'$ W. mag. 7920 feet to "+" on stone and ahu on Keapoo-hina aa flow near its terminus;

8. N. 16° 45' W. mag. 15,444 feet to "+" on stone set in aa and ahu on site of F. S. Lyman's old ahu at the North corner of the land of Kioloakaa;

9. 37° 15' W. mag. 1327 feet to "+" on aa boulder set on edge of aa flow near edge of Koa and Ohia forest on site of F. S. Lyman's old ahu;

10. N. 48° 15' E. mag. 335 feet to "+" on stone and ahu on the South side of a Koa stump 40 feet high and 5½ feet in diameter marked "X" on 4 sides by F. S. Lyman at the Northwest corner of Waiohinu;

11. N. 45° 30' E. mag. 12,210 feet to "+" on solid pahoe-hoe rock and ahu in scrub ohia;

12. N. 16° 30' W. mag. 825 feet to "+" on pahoe-hoe rock and ahu on upper edge of ohia forest;

13. N. 46° 15' E. mag. 4818 feet to "+" on pahoe-hoe and ahu by a large ohia tree marked "X" on makai side on edge of forest;

14. N. 35° 00' E. mag. 2541 feet to large "+" on pahoe-hoe rock by ohia tree blazed on 4 sides on edge of ohia forest;

15. N. 13° 30' E. mag. 2030 feet to "+" on stone and ahu on edge of woods;

16. N. 76° 00' E. mag. 2640 feet to "+" on stone and large ahu in open land near edge of forest;

17. N. 32° 00' E. mag. 4752 feet to "+" on large stone and ahu, on site of former ahu, on hillock at North corner of the land of Kaalaiki and about 250 feet mauka of forest;

Thence following the boundary of Kahuku as per bearings and distances taken from Boundary Certificate No. 85, as follows:

18. N. 46½° E. mag. 15,444.0 feet to an ohia tree marked "K" on North side and "V" on South side;

19. N. 42° 00' E. mag. 7524.0 feet to an ohia tree marked X on 4 sides;

20. N. 30¼° E. mag. 15,840.0 feet to an ohia tree marked X and ¼ in edge of timber;

21. N. 23° 00' E. mag. 6765.0 feet to Forest Reserve Monument on site of old "[diamond with dot in center]" and "W" koa tree at the corner of Kaalaala on the boundary between Kahuku and Kapapala, the co-ordinates referred to Government Survey Trig. Station "Kamakaia" being N. 14,722.0 feet, W. 50,274.0 feet;

Thence running as follows by true azimuths, as by survey of Geo. F. Wright:

22. 234° 54' 9625.0 feet along Kapapala Remainder to North corner of Kapapala Forest Reserve fence;

Thence following along Kapapala Forest Reserve fence, the direct azimuths and distances being:

23. 299° 54' 16,477.0 feet to large ohia at East corner of Kapapala Forest Reserve fence, the co-ordinates referred to Government Survey

Trig. Station "Kamakaka" being 12,043.0 feet North and 28,113.0 feet West;

24. 21° 37' 18,375.0 feet to Forest Reserve Monument at Kapapala Forest Reserve fence, near edge of small bluff, the true azimuths and distance to "Kamakamaka" Trig. Station being, 343° 52', 11,930.0 feet;

25. 80° 56' 711.0 feet to ohia post;

26. 48° 39' 839.0 feet to Forest Reserve Monument on the West boundary of Kapapala;

27. 5° 03' 856.0 feet to an iron pipe;

28. 338° 20' 997.0 feet to "F. L." on a large solid rock, the true azimuth to "Kamakamaka" Trig. Station being 334° 13';

29. 347° 00' 1050.0 feet down hillside to "F. L." on set stone and ahu in mud flow on the East side of Wood valley, the true azimuth and distance to "Kamakamaka" Trig. Station being 332° 44', 8990.0 feet and to "Kauhao" Trig. Station being 59° 15', 7813.0 feet;

30. 101° 49' 1238.0 feet along edge of cane on the East side of Wood Valley to "F. L." on young ohia tree;

31. 130° 35' 3933.0 feet along edge of cane on the East side of Wood Valley to Forest Reserve Monument, the true azimuth and distance to "Kamakamaka" Trig. Station being 322° 24½', 13,636.0 feet;

32. 74° 28' 1490.0 feet along edge of cane on the East side of Wood Valley to ohia post;

33. 38° 04' 1926.0 feet along cane edge to Forest Reserve Monument, the true azimuth and distance to "Kamakamaka" Trig. Station being 309° 5', 14,098.5 feet;

34. 17° 23' 3710.5 feet to "F. L." on large solid rock on top of pali on the West side of Wood Valley;

35. 2° 40' 1637.0 feet to Government Survey Trig. Station "Kahaha," the true azimuth and distance to "Puu Enuhe" Trig. Station being 22° 18' 27", 35,177.0 feet;

36. 20° 40' 13,557.0 feet to Forest Reserve Monument in Paaau 1, just mauka of flume, the true azimuth and distance to "Alili" Trig. Station being 9° 25', 5027.5 feet;

37. 54° 40' 11,885.0 feet to Forest Reserve Monument on "Kaumai-keohu Peak" (Clouds Rest), in Moaula, the true azimuth and distance to "Puu Enuhe" Trig. Station being 355° 4½', 13,033.0 feet, to "Mill" Trig. Station being 282° 33½', 21,608.0, to "Alili" Trig. Station being 257° 50', 9079.5 feet;

38. 18° 54' 10,525.0 feet to Forest Reserve Monument on Puu Enuhe ridge on the boundary between Punaluu and Wailua, the true azimuth and distance to "Mill" Trig. Station being 257° 53', 25,057.5 feet;

39. 57° 26' 895.5 feet to "[triangle with dot in center]" on ohia tree at the North corner of Lot 52 Ninole-Wailua Homesteads;

40. 49° 10' 3728.0 feet along Ninole-Wailua Homesteads to Forest Reserve Monument at the North corner of Lot 15 on the West side of 30

foot road, the true azimuth and distance to Forest Reserve Monument on Puu Enuhe Ridge being $230^{\circ} 46'$, 4616.0 feet;

41. $11^{\circ} 09'$ 1540.0 feet along Ninole-Wailua Homesteads to Forest Reserve Monument at the West corner of Lot 16 and South corner of Lot 15 on the East side of 30 foot road, the true azimuth and distance to Forest Reserve Monument on Puu Enuhe Ridge being $219^{\circ} 31\frac{1}{2}'$, 5889.0 feet;

42. $43^{\circ} 25'$ 1450.0 feet to Forest Reserve Monument, the true azimuth and distance to the West corner of Lot 14, Ninole-Wailua Homesteads, being $279^{\circ} 25'$, 65.0 feet, and to Forest Reserve Monument on Puu Enuhe Ridge being $221^{\circ} 35'$, 7336.5 feet;

43. $25^{\circ} 37\frac{1}{2}'$ 5353.0 feet to Forest Reserve Monument on Puu Iki, the true azimuth and distance to "Kumuohelo" Trig. Station being $4^{\circ} 46'$, 18,111.0 feet, to "Papaloa" Trig. Station being $319^{\circ} 12'$, 8396.0 feet, to "Puu Enuhe Ridge" Trig. Station being $214^{\circ} 51'$, 12,562.5 feet, and to "Kaumaikeohu" Trig. Station being $207^{\circ} 35'$, 22,866.5 feet;

44. $24^{\circ} 40'$ 17,057.0 feet to Forest Reserve Monument at Puulepo, a small rise at the North corner of Honuapo on the boundary of Hionaa, the true azimuth and distance to "Kumuohelo" Trig. Station being $114^{\circ} 15'$, 6165.0 feet, and to "Puu Enuhe" Trig. Station being $219^{\circ} 25'$, 29,687.5 feet;

45. $47^{\circ} 20'$ 2000.0 feet to gulch at the Northwest corner of Honuapo on the boundary of Kioloku, the true azimuth and distance to a Forest Reserve Monument on the East side of gulch being $227^{\circ} 20'$, 35.0 feet;

46. $58^{\circ} 32'$ 7035.0 feet along Kioloku and Kaunamano Homesteads to "W" in bed rock of gulch on the boundary between Kaunamano and Kahilipalinui;

47. $56^{\circ} 08'$ 7156.0 feet across Kahilipalinui and Waiohinu to point of beginning.

	Acres.
Land of Kahilipalinui (Hutchinson Sugar Co.) contains.....	165.0
Land of Hileanui (Hutchinson Sugar Co.) contains.....	2,620.0
Land of Hileaiki contains.....	37.0
Land of Punaluu (Bishop Estate) contains.....	1,275.0
Land of Paauau 2 (Bishop Estate) contains.....	1,675.0
Land of Keaiwa (Hawaiian Agricultural Co.) contains.....	460.0
All Government lands	59,618.0

Total Area of Kau Forest Reserve..... 65,850.0

AND I do hereby set apart as the Kau Forest Reserve those portions of the Government lands known as Kapapala, Moaula-Kopu-Makaka Mauka, Mohokea 1 and 2, Ninole-Wailua Forest and Kaalaiki, (respectively and more particularly described in Public Lands Office Leases, Nos. 106, 297, 454, 429 and 299); the unleased portions of Kauhuhuula Forest, Kaalaiki (mauka), Kioloku, Kawala-Kaunamano and Hionaa-Hokukano (the

last two being respectively and more particularly described in the expired Public Lands Office Leases Nos. 420 and 421); and also any other remnants of government land not under lease, within the metes and bounds of the above described Kau Forest Reserve.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the Territory of Hawaii to be affixed.

Done at the Executive Building, in Honolulu, this 2nd day of August, A. D. 1906.

GEORGE R. CARTER,
Governor of Hawaii.

By the Governor,

A. L. C. ATKINSON,
Secretary.

RUBBER.

The Government of Brazil has decreed a prize of 30,000 dollars for anyone who exhibits 100,000 *Manicoba* rubber trees (*Hancornia speciosa*) within eighteen months from December, the date of the announcement; and three other prizes of 15,000 dollars, 10,000 dollars and 5,000 dollars, respectively, for the three next largest plantations, the smallest of which, in order to gain a prize, must not be less than 10,000 trees. It appears that, not to speak of the value of the rubber, the coffee trees benefit greatly by the shade afforded by the rubber trees.—*West India Committee Circular*, 19th January, 1906.

For a money crop in the sub-tropical region of Florida, avocados have a very promising look. During the last five years a very large amount of work has been done in systematizing the varieties and in working up the methods of propagation.—*The Florida Agriculturist*.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Shower, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haugha, Forest Nurseryman, Box 331, Honolulu, Hawaii.

CHAS. S. JUDD, Special Forest Agent.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.
Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.
First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 3; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. O. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. O. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1905.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

* Out of Print.

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DEAR SIR—I have received policy for \$20,000, issued to me in favor of my daughter, on the continuous installment plan.

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The Company's liability under this form of contract might be \$20,000 or possibly \$70,000, if my daughter should live to be as old as some of her ancestors.

Yours very truly,

ISAAC W. MARSHALL.

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DIVISION OF ANIMAL INDUSTRY.

Victor A. Nørgaard, *Superintendent and Territorial Veterinarian*.
 J. Charlton Fitzgerald, *Assistant Territorial Veterinarian*.

DIVISION OF AGRICULTURE.

In Cooperation with the Hawaii Experiment Station.
 Jared G. Smith, *Special Agent in Charge*.

CLERKS AND STENOGRAPHERS.

Miss Melika Peterson.
 Miss Ella K. Dayton.

NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.

THE HAWAIIAN FORESTER AGRICULTURIST

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Statistics have recently been published by the Bureau of Statistics of the Department of Commerce and Labor, showing the trade returns between Hawaii and the United States mainland for the twelve months ending June, 1906, as compared with the previous fiscal year. A careful analysis of the returns show that during the year just ended, encouraging progress has been made, chiefly in what are known as our diversified industries. The shipments to Hawaii from San Francisco, New York and Los Angeles in each case decreased during the year in question, while Puget Sound increased its shipments from \$738,380 to \$1,266,367.

With regard to Hawaiian exports to the mainland our staple product only amounted to \$23,840,803 as against \$33,946,036 in the previous year, leaving the enormous deficit of \$10,105,233. It is, however, gratifying to learn that our exportation of refined sugar increased by over half a million dollars during the same period. The refining of sugar in Hawaii is confined to one plantation and is among one of the newest of our industries. The increase in this direction may therefore be regarded as of special importance.

Exportation of honey and bees-wax increased to the extent of \$46,450, coffee increased \$74,976, canned fruits increased \$85,706, hides and skins \$42,333, leather \$14,592, tallow \$7,046, rubber \$1,028, and rice \$141,598.

The increase in canned fruits is chiefly attributable to the development of the pineapple industry, and this item will no doubt continue to develop with marked strides for many years. The export of rubber will, in a very short time, figure conspicuously in the return and will probably form one of our most valuable assets. The production of leather, another of our new industries, has also materially increased, and promises to still further develop. While the sales of Hawaiian rice on the coast have about doubled during the last fiscal year, the

figures are not to be relied upon as a true criterion of the condition of this industry. This commodity figures largely in the importations from the coast, and the statistics at hand do not show the importation of rice from Japan. The consumption of Japanese rice in these islands is very large and would throw an interesting light on the question. There is no doubt, however, that the Hawaiian rice industry has improved its condition materially during the last year. The coffee growers and bee keepers are to be congratulated on the excellent progress they have achieved in their departments.

Among the exports which has lost ground in the last fiscal year, sugar has already been referred to. Fiber has, we regret, diminished to the extent of \$982. This is surprising in view of the excellent quality of Hawaiian grown sisal and we hope in another year to see the old figures again attained. At present there is only one plantation exclusively engaged in sisal production, but there are several smaller growers who will no doubt be soon marketing their produce which will help to redeem the situation. Another item, akin in nature to fiber and which has also depreciated in the amount of its export, is that designated as "straw and palm leaf manufactures." Although the value of these for 1905 was insignificant, viz: \$747, yet this could not be maintained last year and fell to \$559. During the same period our importation of straw and palm leaf manufacturers increased \$7,864 in value and made the imposing total of \$28,864. There seems to be a good field indicated here for the establishment of a factory for the manufacture of articles made from palm-leaf, straw and similar products.

Of imports from the mainland during the past two years, the following items are quoted as affecting more nearly the question of our home industries:

Articles	1905	1906
Breadstuffs, animal feed, etc.....	\$202,337	\$243,588
Cocoa, etc.	9,541	10,788
Coffee	13,431	11,029
Eggs	14,925	12,995
Fruits and nuts	147,300	138,495
Hay	143,420	132,123

Provisions, comprising meat and dairy pro-

duce	524,372	587,334
Rice	303,029	164,863
Salt	7,104	6,034
Tobacco, manufactures of	528,373	494,818
Vinegar	5,241	5,886

While Hawaii will never be able to exclude certain commodities from her list of imports, a full development of her agricultural resources should materially diminish some of the above totals. This appears particularly true of the items enumerated above as Cocoa, Coffee, Eggs and Vinegar. Although certain proprietary brands of cocoa may be preferred and probably account for the value of this import, there appears to be little reason why this article is not grown here and does not even figure on our exports. The production of vinegar from bananas and other articles is a profitable operation and should repay experiment. The large importations under fruits and nuts would seem unnecessary in a country whose climate and soil is particularly adapted to fruit culture. Although much of the imported California fruit, such as apples, pears and plums, could not be produced here, yet the islands should not depend upon other countries for their orange supply. The paucity of Hawaiian grown oranges in the market is remarkable in view of their excellent quality.

The interest which is now being diverted to Hawaiian grown tobacco, makes the value of the importations of this article noteworthy. With an annual local consumption of half a million dollars worth of tobacco, growers of the local leaf should find a home market for their produce to the value of at least one hundred thousand dollars. A valuable export trade would no doubt also attend the production of a cigar possessing superior and characteristic qualities.

Taken as a whole the statistics which are to hand show a marked development of our island industries and indicate that in the near future a greatly increased production will be attained. With sisal and canned fruits already taking a place among our exports, and with rubber, tobacco and fresh fruits promising to establish themselves in the near future, the material prosperity of an increasing number of small producers will be advanced to the immense benefit of the Territory.

The report of the British Consul at San Juan, Porto Rico, upon the trade and industry of the island during the past year, has recently been issued. The most important development of the year has been made in the sugar industry which has been stimulated by the free market of the United States. Much capital is being attracted and many new plantations are in process of construction. The average sugar production is about two tons per acre, which could be greatly increased by fertilization and modern methods of cultivation and extraction. The total value of sugar exported, including molasses, was valued at \$13,433,000, an increase of nearly four million dollars.

About 7,000 acres are devoted to citrus cultivation, seventy per cent. of which is planted in oranges, twenty-five with grape fruit and five with lemons. Few of the citrus plantations have arrived at full yield, but the fruit is of good quality and has obtained high prices in New York. The freight on a box of oranges to New York is about 28 cents, as compared with 72 cents from Florida and 98 from California. Cuba pays 35 cents freight in addition to 56 cents duty per box.

The tobacco industry is rapidly improving the quality of its production. The main crop is exported as cigars to the United States and the inferior grades as raw tobacco to Germany and the Netherlands.

The coffee production showed little advance on last year's depression. Before the great hurricane in 1899 coffee was the principal product of Porto Rico. In 1896 the crop was valued at nearly eight million dollars, while in 1905 it amounted to approximately two millions.

Canning factories are working successfully in two parts of the island and more will be erected as soon as a good supply of fruit is assured.

One of the most important achievements of the Hawaii Agricultural Experiment Station during the past year has been the mission of Mr. J. E. Higgins with a consignment of Hawaiian fruit to the mainland market. Hitherto the exportations of island fruit have consisted almost exclusively of bananas and pineapples. This has been due to several reasons, chief among which are that for these fruits there already exists a demand upon the coast, and also that they are more easily

shipped than many of our equally delicious but more perishable varieties. It has long been desirable to introduce such island fruits as the papaia and avocado pear to the western markets and the chief deterrent to shipments has been the presumption that such fruit could not be subjected to a long sea transit without great deterioration in quality. In order to put this to the test the local Agricultural Experiment Station commissioned Mr Higgins to make a trial shipment of these and other fruits for which it may be desirable to create a market. The result has been very encouraging and the fruit has arrived at its destination in excellent condition. The station is investigating the best methods of packing the fruit and also is determining whether cold storage or exposure to the air on deck is to be preferred. There is little doubt that as soon as the avocado pear and papaia are introduced to mainland consumers the growers of these fruits will find a ready market for all their crop.

The total importations of domestic merchandise to Hawaii during the fiscal year ending June 30, 1906, amount to \$11,771,155, an increase over 1905 of \$127,636. The importation of foreign merchandise to Hawaii during the same year amounted to \$3,275,242, an increase over the former fiscal year of \$260,278. Japan heads the list in the value of direct importation to Hawaii from foreign countries with \$1,247,470 worth of merchandise, an increase over 1905 of about a quarter of a million. Our large Japanese population accounts for the quantity of Japanese commodities consumed in the islands. Chile is second on the list with \$448,608 to her credit, an amount which is almost identical with her figure for 1905. The United Kingdom occupies third place, having sold us merchandise to the value of \$424,976 in the last year, an increase of about \$120,000. Germany has been dispossessed of second place and now comes fourth, supplying us with \$171,497 worth of goods in 1906 as against \$544,534 worth in 1905. British India increased her supplies to \$408,607 from \$345,275 of the year before. Australia occupies next place with \$262,594, having almost doubled her figures in the year. Hongkong and Canada have also both materially increased their shipments which, for the year in question, were valued at \$245,244 and \$22,500 respectively.

Instructions for propagating rubber trees have recently been issued by the Forestry Department of the Board of Agriculture and Forestry. The department has recently secured supplies of fresh Ceara rubber seeds and is distributing them to anyone who will undertake to plant them and report to the Board the results they obtain. At Nahiku, on Maui, Ceara rubber trees have attained sixteen feet growth within a year and it is desirous of experimenting in other localities in order to ascertain under what conditions in Hawaii the Ceara grows best. In its natural habitat, and in those localities in which it has been cultivated with success, the tree has been subjected to a moderately dry climate. It is therefore remarkable that such a rapid development should have been attained at Nahiku where the rainfall is excessive. It is hoped that the offer of the Board of Forestry will be widely responded to in order that the best rubber growing districts may be ascertained.

By an agreement with Mr. H. P. Baldwin, representing the large planting companies of central Maui, a large tract of private land comprising over forty thousand acres has been placed for a period of seventeen years under the administration of the Board of Agriculture and Forestry. The government will maintain the land in question together with its own portion of the watershed of the northern side of Maui, as a forest reserve, certain privileges of commercial use under the direction of the Superintendent of Forestry being conceded the grantees.

Instructions have recently been received from the Lighthouse Board of Washington directing the immediate draughting of plans for a lighthouse at Makapuu. Sixty thousand dollars was appropriated for this purpose during the recent congressional session. It is expected that the new light will be a revolving one erected 150 feet above sea level. Such a light is visible thirty miles at sea and its maintenance will require the services of three men.

BOOK REVIEW.

Practical Forestry, For Beginners in Forestry, Agricultural Students, Woodland Owners, and Others Desiring a General Knowledge of the Nature of the Art, by John Gifford, Assistant Professor of Forestry, New York State College of Forestry, Cornell University. Illustrated. New York. D. Appleton & Company.

The aim of the author of the above book has been to include those parts of the science and art of forestry, which are of interest and importance to the general reader and beginner. In this he has been successful and the subject is reviewed in an untechnical and popular, yet accurate manner. The book seems well adapted for use, in conjunction with commercial and physical geography, as a text book in educational institutions offering a forestry course.

It is to be regretted that in the past the art of forestry has in many countries not been appreciated at its full significance. It has not generally been understood that in the preservation of forest areas lies one of the most important resources of a country. If properly maintained this resource is a living and perpetual one, of more lasting benefit than that derived from mineral wealth which in time must become exhausted. The successful application of the rules of forestry insures to a nation the maintenance of many industries upon which it depends for its welfare and prosperity. The importance of this is fully shown in *Practical Forestry*. The introductory chapters are devoted to a definition of the subject and to such technical terms as are necessary to the general reader. The various functions of the forest as an agent in modifying the surface of the earth and in affording a protection to the destructive forces of nature are then dealt with at some length, as is also their importance in the formation and improvement of the soil and in the conservation of moisture.

The second part of the book treats of the creation, preservation and development of forest areas. In this connection the adaptability of certain species to environment is discussed together with their propagation and economic value.

In part three will perhaps be found the most interesting section of the book. The descriptions of such forest industries as

lumbering and the destructive distillation of wood, and the processes of manufactures of wood pulp, cellulose, maple sugar, resin, turpentine and tan bark, afford a mass of readable and important information. The chapter on the forest trees and products of the tropics is doubtly interesting to Hawaiian readers and we would gladly have seen this department of the book greatly increased. While from a botanical and scientific point of view and also from that of the application of forestry methods the book affords a valuable store of accurate information, it is evident that the author's knowledge of tropical agriculture is not so well grounded as that which he possesses of the forestry conditions in more northern countries. One or two references to the Hawaiian Islands are somewhat misleading, as for instance the statement relating to the export of candle-nut oil from the "Sandwich Islands."

Apart from one or two inaccuracies of a like description, which in no way detract from the value of the work in its utility to forestry students and which may be looked for in the compilation of numerous facts embracing a knowledge of many countries, the book is to be commended for its scope and practical utility. It concludes with a list of fifty important American forest trees, twenty-five of which are conifers and twenty-five hardwoods. To each species a general description is given together with its economic use and method of propagation. A comprehensive index adds greatly to the usefulness of the work.

All who are attracted by a most interesting subject and who do not wish to be oppressed by a multitude of burdensome technical terms will derive much enjoyment and information in the perusal of *Practical Forestry*.

MASTIC FOR LIMING RESERVOIRS.

The mastic recommended by the Texas Experiment Station for liming reservoirs and irrigation ditches is as follows:

An even slope of 45 degrees is given to the walls and a coat of mastic applied throughout to a thickness of one-half inch over the inner side of the walls and on the bottom of the reservoir. The mastic is applied at the rate of 52 pounds per square yard

surface. It is comprised of 25% coal tar, 73% sand and 2% lime. Before mixing these materials, a part of the coal tar is boiled for a short time and then burned off or flashed, to cause it to set or "pitch" when the material cools. All of the materials should be hot when mixed, and the mastic should be applied hot to the ground surface, beginning at the bottom and working up. A few days after the mastic has been applied and it has had time to harden, a coat of flashed coal tar is applied to the mastic, which when dry gives a glazed impervious coat, resting on an elastic foundation.

It is important when using this mastic on filled earth such as the inner face of an earthen dam, to permit the dirt to become thoroughly compacted and settled before the application.

At the Texas Experiment Station a reservoir 8 feet deep, 28 by 48 at the bottom and 44 by 64 feet at the top, was constructed for \$105, including the cost of labor and material. Experiments made with asphalt instead of coal tar were unsatisfactory.

JARED G. SMITH,

Special Agent in Charge of the Hawaii Experiment Station.

FARMERS' BULLETINS.

The following new Farmers' Bulletins have been issued by the U. S. Department of Agriculture. They may be obtained free on application to the Secretary of Agriculture, Washington, D. C.

No. 261. *The Cattle Tick in Its Relation to Southern Agriculture.* By August Mayer, Shreveport, La. Pp. 24.

This bulletin describes the effect of the tick on cattle, its injury to the cattle industry in the South, the necessity for its eradication, and the benefits that would follow.

No. 262. *Experiment Station Work—XXXVI.* Compiled from the publications of the agricultural experiment stations. Pp. 32, figs. 2.

Contents: Water for table use; Phosphates; winter wheat; glutenous and starchy wheat; dry farming; methods of canning; beet molasses and pulp; feed lots; guinea fowls; color of eggs; spraying for scale insects; white pine in New England.

No. 265. *Game Larvæ for 1906.* By T. S. Palmer and R. W. Williams, Jr., Assistants, Biological Survey. Pp. 56, figs. 4.

A summary of the provisions relating to seasons, shipments, sale, and licenses.

FOREST SERVICE.

(From the Year-book of the U. S. Department of Agriculture,
Report of the Secretary.)

During the past year the Government work in forestry entered upon a new phase. Practical work in the actual introduction of forestry began in 1898, but it was not until February, 1905, when the care of the National forest reserves was transferred to the Department of Agriculture, that the Forest Service became an administrative organization.

This transfer was a logical outcome of the recent work of the Service. During the last six or seven years it has passed through a remarkable development, which has followed but not kept pace with its demonstration of capacity for public usefulness. On July 1, 1898, the Division of Forestry employed eleven persons, of whom six filled clerical or other subordinate positions, and five belonged to the scientific staff. Of the latter, two were professional foresters. The Division possessed no field equipment; practically all of its work was office work.

At the opening of the present fiscal year the employees of the Forest Service numbered 821, of whom 153 were professional trained foresters. Field work was going on in 27 States and Territories, from the Atlantic to the Pacific and from Canada to Mexico. Over 900,000 acres of private forest were under management recommended by the Service, and applications on file for advice from owners contemplating management covered 2,000,000 acres more. During the year nearly 62,000 letters were sent out from the offices at Washington, the majority of them in reply to requests for information and advice from the public, of a kind which could not be met by printed information.

This contrast imperfectly indicates the full extent of the change which has taken place, and the progress which has been made. Seven years ago there were in the whole United States less than ten professional foresters. Neither a science nor a literature of American forestry was in existence, nor could an education in the subject be obtained in this country.

The real need of forestry was urgent. A time had come which presented at once a great opportunity and a dangerous crisis. Forest destruction had reached a point where sagacious

men—most of all, sagacious lumbermen—could plainly discern the not distant end. The lumber industry, vital to the Nation at large, was rushing to its own extinction, yet with no avenue of escape apparent until forest management for future crops should be forced by famine prices. Meanwhile, however, the ruin would have been wrought already.

Timber-land owners were selling their holdings or their stumpage with little evidence of an understanding of their future value, and lumbermen were compelled by business competition to keep down the cost of operation to the lowest terms or market their product at a loss.

Forestry was both an evident economic need and an apparent economic impossibility. Few well-informed persons believed that the obstacles to its introduction could be overcome sufficiently to bring it into common practice among private owners during the lives of the present generation.

That the whole situation is profoundly altered is directly and chiefly due to the work of the Forest Service. With its offer of practical assistance to forest owners made in the fall of 1898, its field of action shifted from the desk to the woods. The lumberman was met on his own ground. Uncertain speculations were converted into business propositions and untried theories into practical rules. Actual management for purely commercial ends has been taken up and applied on their own holdings by some of the best known lumbermen in the country. What lumbermen as a body now think of forestry is illustrated by the recent effective movement in their National association to endow a chair of lumbering at one of the forest schools.

Forestry is a matter of immediate interest to every household in the land. Forest destruction is no imaginary danger of a distant future. If it is not speedily checked its effects will sooner or later be felt in every industry and every home. To make these facts known is a National duty. The work of education must continue until public opinion will not tolerate heedless waste or injudicious laws.

PRESENT STANDING OF FORESTRY.

The period which has passed since 1898 has been, in forest work, a period of large definite accomplishments and of effective preparation for the future. Of the exact knowledge con-

cerning our American forests, upon which the practice of scientific forestry depends, vastly more has been gathered during the last seven years than previously from the time Columbus landed. In 1898 the Division of Forestry had hardly approached the specific problems of forest management in the United States, and had developed no efficient methods of attacking them. The records now on file are based on the measurements of millions of individual trees. Commercial tree studies looking toward management have been prosecuted for 32 important species. Working plans have been prepared in 28 States, and field work has been conducted in every State and Territory in the United States, and in Porto Rico, Alaska, and the Philippines.

The scientific knowledge gathered in the field has taken form in a rapidly growing literature of the subject, and has furnished the basis for a system of professional education. Today there is scarcely more occasion for the American to go abroad to study forestry than to study medicine or law.

Besides creating a science of American forestry, the Forest Service has worked out the methods of operation by which forestry may be put in practice. It found in existence a fully developed system of lumbering, which had brought efficiency and economy of labor to the highest point, but was often wasteful of material and regarded forests as simply so much standing timber to be cut. Men taught to regard cheap logs at the mill as the supreme test and sole end of good lumbering, justly proud of their proficiency in a highly specialized industry, and impatient of restraint, could not be expected to welcome with cordiality changes for a purpose whose utility they were necessarily slow to recognize. To work a reform it was necessary to begin with existing conditions and improve them instead of criticising them. Had not the Forest Service taken the lead in finding out just how practical rules for conservative lumbering might be laid down and carried out forestry could not have reached the point at which it now stands in the United States.

In the field of economic tree planting the same story is repeated and shows definite, important, and permanent results. It is true that in 1898 farmers throughout the Middle West, where tree planting finds its largest field of economic usefulness, were already alive to their need of planted timber. But

the knowledge of what kinds of trees to plant and how to make them grow was imperfect. These were the fundamental problems: (1) The comparative adaptability of various species to regional and local conditions of climate, soil, and moisture; (2) the comparative usefulness of the species which can be made to thrive; (3) the protective benefits of planted timber; and, (4) the rate of growth and the future yield which can be expected.

Substantial progress toward the solution of all of these problems has been accomplished. The Forest Service has made in all 300 separate planting plans for private owners, covering an aggregate area of over 50,000 acres, in 36 States and Territories. It has completed regional studies of the broad conditions in the New England States, California, Kansas, Nebraska, Iowa, eastern South Dakota, western Minnesota, Illinois, Oklahoma, and the Ohio Basin in Ohio, Pennsylvania, and West Virginia. These studies largely supersede the necessity of future individual studies on the ground. It is now in a position to exercise great helpfulness in the whole planting movement throughout the United States. It has established in the minds of western farmers generally the fact that tree planting can be made successful and that it adds to the money value of their farms. It has also called attention to the great hygienic importance of tree planting on the watersheds; of public water supplies of cities, east and west; has developed practical methods for reforesting denuded mountain slopes and for establishing new forest growth in regions of little rainfall, and has powerfully contributed to the great work of reclaiming desert lands through water conservation and to the whole irrigation movement.

THE GAIN IN ECONOMY OF USE.

The Forest Service has in the last seven years added greatly to our visible forest resources. In the saving of waste it has enriched the country by many millions of dollars, and in this way alone has added vastly more to the National wealth than its total expenditures for all purposes during its entire history.

Its most important achievements in decreasing the drain upon our forests by providing for their more effective utilization have been along four lines—determination of the strength

of different kinds of timber, studies of methods by which timber may be made more durable, efforts to decrease waste in lumbering, and the discovery and introduction of better methods of gathering forest products other than lumber.

By its timber tests the Forest Service has established the suitability of various little-used but abundant woods, especially for structural uses, and has made possible the more economical use of other woods by an exact determination of their strength. By its studies of the effects of seasoning and the value of different methods of preservative treatment, it has opened the way to an enormous reduction in the drain upon our forests for railroad ties. What this demand at present is may be realized when it is considered that if a tree were growing at each end of every railroad tie laid in the track in the whole United States all the timber produced would be needed for renewal alone. In other words, two trees must always be growing in the forest to keep one tie permanently in the track.

By its studies of lumbering methods the Forest Service has shown lumbermen how timber formerly wasted in high stumps, tops, and logs left in the woods could be utilized without added expense. And a not less serious waste of a great resource was cut off when the invention of a new method of turpentine made it possible to eliminate the destruction of our southern forests through boxing the trees, and at the same time to gather a far larger value in turpentine than before.

FOREST EXPLORATION.

Finally, the Forest Service has rendered a great service by its explorations of forested regions. Useful contributions to the knowledge of our forest resources have been made through specific studies of important regions. The guiding principle of this policy is, of course, that all land should be put to its best use. This principle the Forest Service has assisted to put into effect by its recommendations as to what lands should not as well as what should be reserved.

RESERVE ADMINISTRATION BY THE FOREST SERVICE.

The forest Service had become fully qualified, by its past work, for the responsibility laid upon it by the transfer of the reserve to its administrative charge. The immediate effect of

the change was the opening of the reserves to much wider use than ever before. This is the natural consequence of intrusting the care of these great forests to the only branch of the Government which has the necessary technical knowledge. The inevitable consequence of a lack of such knowledge must be the restriction of right use or the practical certainty of misuse. Only under expert control can any property yield its best return to the owner, who in this case is the people of the United States.

Under the system of administration now in force everything affecting the reserves is determined or executed by men of expert knowledge, familiar with local conditions. This entire force has become a part of the classified civil service. Timber is cut only under the supervision of trained men in accordance with a plan carefully prepared to safeguard the permanent welfare of the forest; yet the sales of timber have many times increased since the Forest Service took charge. A far more complete control is exercised than formerly, yet the net cost to the Government of all the work of the Service will be less for the present year than that of the Bureau of Forestry alone before the transfer. A property worth in cash not less than \$250,000,000 is administered at a cost of less than one-third of 1 per cent. of its value, while increase in that value of not less than 10 per cent. per annum is taking place. As the use of the reserves increases the cost of administration must, of course, increase also, but receipts will certainly increase much more rapidly. The forest reserves are certain to become not only self-supporting but a source of large public revenue.

WORK OF THE YEAR.

The transfer of the National forest reserves to the care of the Department of Agriculture was effected on February 1, 1905. The administration of these vast forests fell quietly into its place in the Service, and has since been conducted with steadily advancing efficiency. Every office in the Forest Service is actively concerned in their management, working and planting plans are in preparation and have been prepared for various parts of them, and they are absorbing and will continue to absorb a greater and greater part of the work of the Forest Service.

FOREST MANAGEMENT.

Public Lands.

On the public lands greater strides were made in the introduction of forest management than ever before. Wherever on the reserves timber is in present demand working plans are being prepared which will insure the best use of the forests. On the Chippewa Indian Reservation, in Minnesota, the complete success of the plan to secure the perpetuation of the forests is assured. In California, Colorado, Montana, South Dakota, and Wyoming studies of leading commercial trees have provided a basis for the intelligent management of the forests in which these trees hold an important place, including many of the reserve forests.

Private Lands.

The movement to introduce forest management on private lands is spreading rapidly, especially in the Pacific Coast States and the Middle West. Nearly four-fifths of the applicants for cooperative assistance were small owners. The total area for which assistance was asked was nearly 1,500,000 acres. Examinations to determine the practicability of management were made of 22 large timber tracts in 15 States, and detailed working plans were made for 8 large and 81 small tracts, with a total area of almost 2,000,000 acres.

FOREST EXTENSION

Up to the present year the work in extension found altogether its largest field of usefulness in the preparation of planting plans for farm protection and local timber supply in the scantily timbered regions of the Middle West. It is certain that tree planting will always hold an important place in farm economy, but it is more and more becoming possible to supply the needed information for this work from the central office as a result of regional studies. The large projects involved in the establishing or replacing of forests on reserve lands now unforested, and in demonstrating to the consumers of timber that they must provide for their future needs, will probably for the next few years increasingly claim the attention of the Forest Service.

During the year a revision of the terms of coöperative assistance was made to induce wider acceptance by small owners. Up to the present time 380 planting plans have been made, of which 49 were made during the past year.

Reserve planting during the year included the establishment of nurseries in the Santa Barbara and Gila River reserves, broadcast sowing and field planting on the Black Hills Reserve, and field planting in the San Gabriel and Dismal River reserves, besides the extension of previously established nurseries. The experiment in broadcast sowing in the Black Hills is especially notable, because the results obtained now appear to be entirely favorable and because success has never before been gained under this method in this country. The significance of this fact lies in the enormous difference in the cost of reforestation by sowing seed on ground not previously prepared and of rearing and transplanting nursery stock for large areas.

By the completion of the coöperative study conducted in the State of California valuable information was secured concerning the relation of chaparral to water conservation and forest renewal and concerning fire protection.

FOREST PRODUCTS.

Lines of coöperative work now completed have brought definite and important results in introducing preservative treatment as a means of increasing the durability of ties, and thereby decreasing the drain upon the forests. The results give good reason for the belief that tie preservation will shortly become practically universal.

The study of the preservation of telegraph and telephone poles promises further economies of the same kind.

In timber tests, studies of red gum, red fir, western hemlock, and loblolly and longleaf pine have furnished facts which will lead to the wiser use of these species and of structural timber generally. Strength tests of woods for other purposes have been begun, and methods have been prepared for the more extensive prosecution of this very practical work; but the full utilization of the opportunity presented for public usefulness must wait until the necessary facilities are provided.

DENDROLOGY AND FOREST EXHIBITS.

Progress was made during the year in the general study of forest distribution, classification, and composition throughout the United States, especially through regional studies. Previous studies of basket willows and turpentine methods have been continued with further helpful results.

NOTICE.

The next regular meeting of the Farmers' Institute of Hawaii will be held at the Library of the Territorial Board of Agriculture and Forestry on King street, Honolulu, Saturday, September 29, at 7:30 p. m.

This is the last meeting of the year and is to be made an important occasion in the interest of Hawaii's agriculture; the fascinating subject of Hawaiian fruits and the possibilities of tropical fruit-culture in these Islands is to be presented by able speakers, and cannot fail to arouse interest in this neglected, but very important island resource.

The program will be as follows:

"Fruit Culture as an Industry in Hawaii," President Jared G. Smith.

"Hawaiian Fruits," Dr. William T. Brigham.

"Tropical Fruits as Food," Dr. Edmund C. Shorey.

"Horticultural Insect Enemies, (exhibition of specimens,)" Mr. D. L. Van Dine.

A cordial invitation is extended to all who are interested.

(Signed) F. G. KRAUSS,
Secretary.

STREET IMPROVEMENT.

Pensacola street will, in a few years, be one of the most beautiful in the city. Through the generosity of Mrs. Wilder the thoroughfare has been planted on both sides with golden shower trees.

MISCELLANEOUS NOTES.

HEREDITY IN STOCK.

Any phenomenal traits, but more especially that of milk, appear to be obtained far more through the bull than the cow, hence so many of our short-pedigreed or non-pedigreed cows and heifers are daily proving better dairy cattle than those of long standing pedigree. There is undoubtedly in the case of heavy milkers a tendency to weaken the constitution of the cow, both as regards health and also as regards the ability to impress the offspring. These cows, it is quite possible, indeed, it appears to be the case, give more effect to their male offspring than to the female, as bulls from such animals quite as a rule beget much better milkers than the bulls from cows of light milking properties.—*Journal of the Jamaica Agricultural Society.*

DAIRY INSPECTORS.

The first examination for the appointment of supervisors under the Milk and Dairy Supervision Act has just been completed. Two hundred and sixty candidates presented themselves for examination and 22 passed. The examination was divided into three parts—written, oral and practical, but no candidate was rejected on the written paper alone. The examiners required first, practical experience; second, general education; and third, sound common sense and tact, with a knowledge of the underlying principles of agriculture—men who could not only do a thing, but who could say why they did it, and who were able to explain their reasons lucidly to a farmer. Of the 22 successful candidates, 10 were dairy farmers, 5 factory managers, 3 veterinary surgeons, 1 an analyst, 1 a shire inspector, 1 an inspector of the Agricultural Department and 1 a dairy hand. They ranged in age from 20 to 44.—*Journal of Department of Agriculture, Victoria.*

THE SCOTIA FIRE BEATER.

Those who have had experience in subduing fierce bush fires know what exhausting work it is to stop a fire when it is assisted by a high wind, and how difficult it is to beat it down in high grass with the usual implements—green bushes or gunny

and flour bags. A very capital contrivance has been invented for the purpose by Mr. John Wilson of Brisbane. It consists of a handle 3 feet 6 inches long, 1 1-8 inches round, at the end of which is a knob, conical in shape, made of red gum. A sheep-skin basil, having a hole in the center, is slipped over the handle and is secured from coming off by the gum knob. A chafering piece is provided inside and outside of the basil to prevent friction and the three pieces are firmly rivetted together. Over the top of the handle a metal socket is passed, which keeps the whole in position, and is secured by a screw. One of the best points of the invention is the admirably adjusted weight of the socket, which enables a firm downward effective blow to be given when dealing with cane or heavy grass. There is nothing like leather!—*Queensland Agricultural Journal*.

IMPROVEMENT OF PASTURES.

In a recent address by Professor Angus, he deplored the little attention given to the improvement of grazing land. Year after year they were impoverishing the land by feeding, and they gave nothing in return. He explained at length the best manures to use for improving grazing lands, and the methods of using them. Even poor land, if broken up, drained and properly treated, could be made to yield good pasturage. He emphasized the necessity of lime dressing land to sweeten the herbage and to get rid of mouldy conditions. As manures for grazing land he favored Thomas phosphate or basic slag and bones.—*Journal of Agriculture of South Australia*.

POULTRY MANURE.

The most valuable of all animal manure is poultry droppings. It is most useful just where it is most needed—the vegetable garden. The poultry of Jamaica could produce value to the extent of many thousand pounds of manure if it were all saved. But how few people house their poultry as night? Fresh earth should be put beneath the roosts every day—(five minutes is enough time to clear the place up every morning) and the manure should be put in a barrel under cover till the barrel is nearly full, when it should be applied to the garden.—*Journal of the Jamaica Agricultural Society*.

THE WORLD'S RUBBER CROP.

The total annual production of rubber throughout the world was 57,000 tons. Of this total 55 per cent. came from South America and Africa. The French possessions on the West Coast of Africa produced 7,000 tons, the French Congo 3,000 tons, while the output of the Belgian Congo does not exceed 6,000, notwithstanding popular opinion to the contrary. The United States consumes 26,470 tons, Germany 12,800 tons, Great Britain 10,000 tons, France 4,130 tons, Austria-Hungary 1,520, Holland 1,218, Belgium 7,480 and Italy 588 tons.—*Jamaica Agricultural Society*.

GINGER.

According to Gillespie Bros. & Co.'s New York Market Report for March 16, ginger continues to be the principal factor in the spice market. The continued upward movement of the market and the situation in Jamaica, make it almost impossible to attempt to predict what price Jamaica root will reach, or even to name quotations. London has advanced 2 shillings per cwt. within the past fortnight and buyers have advanced their offers 1 cent per lb., but were unable to obtain any ginger even at this advance.—*Bulletin, Department of Agriculture, Jamaica*.

POTATO MANUFACTURES IN GERMANY.

No less than 2,000,000 tons of potatoes are used in Germany in distilling spirits, the residue from the distillation operation being used as a cattle food, besides another 2,000,000 tons annually are used in the production of starch, and in addition there is manufactured from the potato,—syrup, flour, dextrin, etc.—*Jamaica Agricultural Society*.

SILK WORMS AND WASPS.

In experiments with silk worms, recently conducted in Jamaica, it was found that the common wasp (*Polista*, sp.) proved their most formidable enemy. It killed and devoured the caterpillars whenever they approached too closely to the netting where they were confined.

At a competition inaugurated by the government of South Australia in 1890, in which prizes to the value of \$750 were offered for machines for gathering stones and stumps lying loosely on the surface, only one machine was forthcoming. A field had previously been prepared to test competing machines, and a liberal supply of stones had been carefully strewn. The solitary competitor proved a failure and the owner of the field had the doubtful satisfaction of gathering up the stones again by hand.

A Guernsey cow belonging to Mr. Riethrock of Athens, Wis., holds the world's record for butter production. The cow is nine and a half years old, and during the year commencing October, 1904, she yielded 14,920.8 pounds of milk, containing 857.15 pounds of butter fat, equivalent to 1,000 pounds of butter.

The world's cocoa crop in 1903 was 125,895 tons, which increased in 1904 to 146,552 tons.

RUBBER PRODUCTION.

The total acreage of rubber plantations in Asiatic countries at present is approximately as follows:

	Acres
The Straits and Malay States.....	30,000
Sumatra	5,000
Java	5,000
Ceylon	25,000
India and Borneo.....	5,000
Total	70,000

This acreage will be in full bearing in 1911.

Allowing a yield of 200 pounds per acre, 14,000,000 pounds of rubber will be produced by the above countries in 1911.

The world's production of rubber in 1898 was about 134,000,000 pounds.

The present production is about 156,000,000 pounds.

RECENT PUBLICATIONS.

Report on Agricultural Investigations in Hawaii, 1905, by Fred G. Smith. U. S. Department of Agriculture, Office of Experiment Stations, Bulletin No. 170. This publication is a summary of the principal work during 1905 of the Hawaii Experiment Station. During the year important work has been conducted in ascertaining the value of the black-wattle in Hawaii as a source of tan-bark. The results of these investigations have already been published by the station in Bulletin No. 11. The trees available covered about six acres, growing on the station grounds at an elevation of about 700 feet. About 10 tons of dry bark were obtained, averaging in value \$23.31 per ton. A yield of 6 tons of bark may be considered very low, but the small crop is attributed to causes which can easily be obviated. It is believed that wattle cultivation would prove extremely profitable if a sufficient acreage were planted to enable the owner to market a definite amount of tan-bark every year after the plantation has reached maturity.

Perhaps the most important field work of the year has been achieved in tobacco growing experiments. The station is to be congratulated upon the valuable results it has obtained in this section which will no doubt have a far reaching effect upon the future agricultural development of the Territory. Even though the Hawaiain crop must be marketed in open competition with Cuban and Sumatran leaf there is a sure success for certain types of tobacco which the experiments have shown to be suitable for growth in the islands.

Probably the new industry which is attracting most attention in Hawaii today is the cultivation of rubber. The outlook for this is particularly promising. The conditions in Hawaii are believed to be extremely favorable for the cultivation of para rubber trees and one of the newly formed companies has already planted 100,000 seeds of this species and expects to have half a million trees growing within two years.

The cultivation of cassava for the production of starch has also been carefully investigated during the year and important data has been secured.

During the year the following publications have been issued: Bulletin No. 8.—Methods of Milking.

Bulletin No. 9.—Citrus Fruits in Hawaii.

Bulletin No. 10.—Insect Enemies of Tobacco in Hawaii.

Press Bulletin No. 11.—The Common Liver Fluke in Hawaii.

Press Bulletin No. 12.—Tobacco in Hawaii.

Press Bulletin No. 13.—Rubber in Hawaii.

Press Bulletin No. 14.—Fuller's Rose Beetle.*

The report of the chemist occupies many pages of matter, which although uninteresting to the ordinary reader, is extremely important in its bearing upon the industries of the Territory. During the year important analyses have been made of island fodder. Many samples of soil have been analysed to determine their suitability to various crops, and also samples of honey, guava jelly, wattle bark, granulated sugar, condensed milk and canned pineapples have been analysed chiefly at the request of manufacturers who often desired information to overcome certain unfavorable conditions in their produce. In this connection the practical value of the chemical laboratory cannot be overestimated.

The report of the Entomologist deals mainly with the bee industry of Hawaii. A partial list of our chief honey producing plants is interesting. During the year the station has successfully introduced the Italian bee into the Philippines. Silk culture has occupied much attention during the year and good results has been achieved. Active work has also been done in the campaign against mosquitoes, not the least important step in this direction has been the introduction to Hawaii of mosquito-eating fish, an account of which has already appeared in the Forester. A partial list of injurious insects in Hawaii (part 2) and also a partial bibliography of Hawaiian Entomology make the Entomologist's report of special value.

The report of the Horticulturist shows much work has been accomplished to assist in the development of our resources. During the year important experimental shipments of island fruit have been made to the mainland, which have taught much as to the best means of placing island fruit in the coast market. Important reference is made to the litchi, mangosteen, wi, and various other horticultural products which should ere long find a place in the list of Hawaiian products.

* The "Maul" or "Olinda" Beetle.

The Mango Weevil, by D. L. Van Dine. Press Bulletin No. 17, Hawaiian Agricultural Experiment Station. As if not content with the innumerable insect pests with which our growers and entomologists have to combat, nature or rather ill chance has inflicted another unwelcome visitor upon us which now threatens the most important fruit food of the larger portion of the inhabitants of Hawaii. The intruder is known as the Mango Weevil and it belongs to the same family as the Cotton Boll-weevil which, since 1892, has destroyed \$50,000,000 worth of cotton in the southern United States. The injury inflicted on the mango is primarily the destruction of the seed and also blemishes in the appearance of the fruit. In view of the terribly destructive habits of the family of insects to which this weevil belongs, in looking for the future development of the mainland market and to prevent a prohibition of the export of Hawaiian mangoes, it is important that vigorous measures be undertaken to control the pest. The importance of achieving this may be gauged by the fact that the suggestion is even made in the bulletin to destroy for a period of two years all fruit in infected districts, and the excellent advice is given that all common varieties of mangoes be cut back for in-arching or grafting with finer qualities.

DISTRIBUTION OF RUBBER SEEDS.

The Forestry Department, Board of Agriculture and Forestry, has secured from several sources a fresh supply of Ceara rubber seeds, which are being distributed free, in small quantities, to anyone who will undertake to plant and care for them and report to the Board from time to time what the results achieved are.

The seeds are mailed to applicants together with instructions as to how to propagate and plant the trees.

Already about one hundred persons scattered throughout the Territory have applied for seeds. Each applicant is requested to sign a postal card agreeing to care for the trees and report thereon.

The object of the Board is to get the seeds planted in as many different localities, soils and climates as possible, so as

to ascertain just what can be done with the Ceara rubber throughout the Territory. All of the reports will be compiled and published for the information of the public.

The following is the form of agreement and instructions being sent out by the Board in connection with the seeds:

FORM OF AGREEMENT SIGNED BY APPLICANTS.

Board of Commissioners of
Agriculture and Forestry:

The undersigned hereby agrees to plant and care for seed or seedlings of Rubber trees furnished by the Division of Forestry for experimental purposes, and to occasionally report upon the condition and growth of the same, on blanks furnished for that purpose.

It is the intention of the undersigned to plant the seed or seedlings, on the land of..... owned by, in the District of, Island of Elevation.....

Name

Address

Date:

INSTRUCTIONS FOR PROPAGATING THE CEARA RUBBER (MANIHOT GLAZIOVII).

The Ceara rubber seed has a very thick and hard coating, and natural process of germination occupies some months. The seed should be carefully rasped with a file or ground on both edges of the radicular end without injuring the embryo—the operation requires care. After this treatment, properly performed, the seed should be planted about two inches apart in seed box or bed using, if possible, good soil. If the soil is stiff, about one-half white sand ought to be added and thoroughly mixed. The seed should not be planted over half an inch deep.

PROTECTION FROM RATS IS ABSOLUTELY NECESSARY.

The soil ought to be kept moist and if planted in a box, five or six three-fourth inch holes ought to be bored in it for drain-

age. The seeds should begin to come up within two weeks, when it will be necessary to remove the pulps adhering to the primary leaves, if the weather is dry.

After the third leaf has developed the young plants should be transplanted. Great care ought to be taken to protect the roots from exposure and as much soil as possible remain intact about them. From nine to ten feet apart is considered about the right distance to plant in permanent position.

MAKING HOLES AND PREPARING THE SOIL.

This subject as well as the following one requires particular attention and a little extra labor in making a good hole and preparing the soil properly will pay in the long run.

In stiff or hard soil the holes should be made three feet square and from two and one-half to three feet deep; in free soil smaller holes will suffice.

As the top soil is generally the best it should be put to one side, so that it can be used around the roots of the tree when the hole is refilled. The soil should be well broken up and the turf, if any, should be put grass side down in the bottom of the hole.

PLANTING.

The hole should be filled to within two inches of the surface reserving the best soil to pack about the tree. The soil should be tramped lightly with the feet, after which a small hole should be made to receive the plant. The tree should be planted about one inch deeper than it was before, and the soil packed firmly around it.

CARE OF TREES AFTER PLANTING.

After planting the ordinary care generally given to economic trees will be sufficient.

FARMERS' INSTITUTE MEETING.

As announced the meeting of the Farmers' Institute took place at the Library of the Board of Agriculture on Saturday, September 29th. A full account will appear in the next issue of the Forester.

RABBIT EXTERMINATION.

In order to bring to a successful issue the method of exterminating rabbits advocated by Mr. Rodier, and which has for its motto, "Kill the females and let the males live," the natural law of "survival of the fittest" must come into operation, and it appears to have been accepted that when the males predominate and become the superior sex, the females necessarily become exterminated. There, however, exists a theory, accepted by some as a natural law, which tends to avert the extermination of a species by sexual preponderance, namely, the theory of "cross-heredity of sex," the doctrine of which is that the better nourished and superior parent tends to produce the opposite sex. This theory of "cross-heredity of sex" is strongly supported by the result of the test, for in pen No. 1, (which originally contained 9 does and 3 bucks) of the increase 15 were females and 9 males; in pen No. 2, (originally containing 6 of each sex) of the increase 21 were females and 4 males; in pen No. 3, (originally containing 8 does and 12 bucks) 11 were females and 5 males; in pen 4, (originally containing 4 does and 12 bucks) 7 were females and 4 males; in pen 6, (originally containing 11 does and 1 buck) 7 were females and none were males. Pen 5 was apparently not used for breeding.

The result of this test may be summarized as follows:

1. Preponderance of males tended to decrease the number of young.
2. The males, when in excess, did not generally worry the females to death.
3. The males did not worry each other to any great extent.

It would appear that Mr. Rodier's method resolves itself into a pertinacious effort to kill the last elusive doe.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Shower, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haugh, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.
Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.
First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 176 pp.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 3; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

"On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 3; 4 pp., cut; 1905.

DIVISION OF FORESTRY.

"Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1905.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

"Out of Print.

Any one or all of the publications listed above (except those marked *) will be sent to residents of this Territory, free, upon application to Mailing Clerk
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The Company's liability under this form of contract might be \$50,000 or possibly \$70,000, if my daughter should live to be as old as some of her ancestors.

Yours very truly,

ISAAC W. MARSHALL.

WRITE TO-DAY FOR RATES

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FRUIT NUMBER

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NOTICE FROM THE DIVISION OF ENTOMOLOGY.

The Entomological Division of this Board wishes to inform Hawaiian readers of this magazine that it is always ready and anxious to receive, study and report upon any insects that they may find and submit. When feasible either colonies of beneficial insects will be sent, or simple, inexpensive remedies will be prescribed. No charge.



THE HAWAIIAN FORESTER AGRICULTURIST

VOL. III.

OCTOBER, 1906

No. 10

The event of greatest interest to Hawaiian agriculturists during the month just past was the meeting of the Farmers' Institute, of which a full account appears in the present issue. The secretary, Mr. Krauss, had arranged a very interesting program which attracted a full attendance. It had been arranged to make a special feature of island fruits and the whole of the evening's proceedings bore in some way upon this important subject. The fact which most prominently revealed itself in the course of the evening was that Hawaii is not doing sufficient justice to her fruit producing capacity, but is neglecting a most remunerative branch of agriculture which lies to her hands almost unheeded. It was shown that the Territory is far behind many similarly situated islands, in the matter of fruit production. The West Indian islands, for instance, offer in their markets an astonishing number of excellent fruits in prolific quantity, the greater number of which are known to the ordinary traveller only by name. A mainland visitor to the Honolulu markets is, however, as a rule disappointed by being confronted with a poor supply of perfectly familiar fruit, the greater proportion of which may have been imported from his own country. If perchance he should be favored by arriving here in the mango or avocado pear season he will be offered our island product indeed, but of a variety and quality which few old residents would essay. On such evidence as this tropical fruit is sometimes condemned by mainland visitors as being unpalatable, uninviting and often harmful.

It is extraordinary that the systematic production of high grade market fruit is not in full operation on all the islands. Probably no enterprise offers such a certain return to a large number of industrious men as does this. The subject is well worth the attention of those interested in building up in Hawaii a prosperous community of white settlers. A pamphlet circulated on the mainland descriptive of the promising future of fruit production in Hawaii and giving particulars of lands that could be acquired by

desirable settlers would well repay the cost of production. It is remarkable, however, in view of the situation that it is necessary to appeal outside for fruit growers. There should certainly be found among our present residents many who would be willing to plant small orchards of citrus and other fruits, if the enterprise were brought before them as a business proposition. The planting of five acres of select fruit trees now would, in a few years, provide the owner with a substantial income. The initial outlay of such an undertaking is small and its maintenance such that a man of moderate means could easily afford, in view of the prospective return. With a number of similar orchards established within touch of the Honolulu market the profitable growing of fruit would be one of the substantial factors of Hawaiian prosperity. The necessity of activity in this and other new agricultural operations is all the more urgent in view of the impending annexation of Cuba. Although the consummation of this event is probably many years distant, it is one that must necessarily unsettle the future of all industries dependent upon the sugar market. Now is the time for Hawaii to insure herself against any adverse future contingency of this kind. Every acre of land planted now by small holders and rendered productive, makes this Territory so much the more independent of other countries. With flourishing orange, lemon and lime orchards, plantations of pineapples, rubber and tobacco the day may yet come when Hawaii may view with comparative unconcern the contemplated absorption of other lands by the parent country. We believe that the home demand for select fruit, and the indicated future of the world's rubber and tobacco consumption, warrant the taking up in the Hawaiian Islands of all available land for the production of these commodities. Already signs are not wanting that in a very short time much expansion will be made on the lines we have suggested. The colony of Wahiawa has long proved the wisdom of its founding and is rapidly advancing in prosperity. In a short time there is no doubt that many of its pioneers will be comparatively wealthy men. The advancement of their individual circumstances will be much to the benefit of Hawaii, but greater than all this to the public welfare will be the enhanced taxation return to the public coffers from rich and valuable lands, the foundation of a contented, prosperous and enlightened white population, and the establishment of many minor agricultural industries upon a profitable financial basis. The Palolo settlers are already giving indi-

cations of following in the successful wake of their Wahiawa brethren, and small plantations of flourishing rubber and fruit trees are rapidly springing into existence. With the success achieved in these two instances we hope that the Government will be encouraged to open other fertile lands for settlement. The time for such beneficent action is the present, when cultivation commenced now will be remunerative in five years.

We are gratified to be able to present to our readers the paper read by Dr. William T. Brigham at the recent meeting of the Farmers' Institute. The information therein contained will be of permanent value as a record of the fruit trees which have already been established here, and will lay the foundation of all future works upon our island fruits.

FARMERS' INSTITUTE MEETING.

The regular quarterly meeting of the Farmers' Institute of Hawaii was held in the Library of the Bureau of Forestry, on King street, on Saturday, September 29th. The chair was taken by Mr. Jared Smith, and after the reading of the minutes of the previous meeting the following paper was presented:

FRUITS FOR THE HAWAIIAN ISLANDS.

BY DR. WILLIAM T. BRIGHAM.

My intention in this paper is to mention briefly some of the tropical and sub-tropical fruits that either have been or should be cultivated in these Islands. Of those included in this list the great majority have already been cultivated here, although some, cultivated only in private gardens, have died out through improper cultivation or neglect, and of the remainder I can, with few exceptions, speak from personal acquaintance in other tropical regions. All these I believe can be grown here, and if they can gain admission to our gardens under the present somewhat strict system of inspection which deters most amateurs from trying the risky experiment of importation, will add to our table

attractions. Doubtless other travelers in tropical regions might add other fruits from their own discoveries, and perhaps I shall be told that others in my list have been tried and found wanting, but this Institute is founded for the helpful increase of knowledge, and such criticisms tend that way.

I am in a position to come in contact with the most intelligent of our visitors and the question is often asked "Where are your native fruits?" They repeat what we all know that our markets are filled with the fruit they have just eaten in California, and could have eaten all over the United States. They find neither in the market nor at their hotels anything else. Occasionally one can find at a Chinese fruit stall breadfruit, (which I have seen one of our military visitors trying to eat as he would an apple,) soursops, carambolas, and water lemons and ohia ai get more generally into the market at times, but where outside our own gardens can even good bananas be obtained? Go to the West Indies, Jamaica, for instance, and you may not be there in the best season, but will always find such a display of fruit as will astonish and puzzle you. You will need a guide to direct you to what is best, so great is the variety. The same might be the case here with a little exertion and my object tonight is to call attention to some neglected fruits, and perhaps suggest new uses of what we have, to in some measure remedy a state that all visitors notice and deplore. Some-years ago it was my privilege to entertain at luncheon a party of friends from Boston, and I placed before them thirteen fruits that the majority of the party had never before tasted, and many were entirely unknown by name, but all were liked, and on his return to Boston one of the party described that luncheon in an address on these islands, and I fear that I shall never hear the end of that fruit unless some of you will kindly surpass it with some of the newspaper visitors that come here.

I have arranged my list not in alphabetical order, but in the natural sequence of families as generally recognized by botanists, and I should warn you at the beginning that the specific, and sometimes even the generic names of fruit-bearing plants are not always of universal acceptance, a situation easily explained by the astonishing variation among cultivated fruits, a variation which Mr. Luther Burbank has taken advantage of to produce those results that have astonished so many visitors to Santa Rosa, besides myself. The fruits that are attractive to man he cultivates and most of them respond to cultivation until those that have long

been the object of man's care, like the banana and orange, can no longer be traced to their parent form. Few but botanists would recognize the blood-relationship between the medlar that is unfit to be eaten until rotten and the apple of our modern horticulturalists, perhaps the most universally accepted fruit.

But I am getting upon dangerous ground, for in matters of taste man (alone perhaps of animals) fortunately differs from man, and what is a good fruit to one is quite insipid to another; to some, apples are poisonous, to others oranges; and an English officer has declared the foul-smelling durian to be "*undoubtedly* the finest of fruits." So I will neither quote Humboldt's three best fruits nor give my own preferences. And this the more readily since we all know that the same fruit grown under different cultural or climatic influences produces a very attractive or only a fairly good result. The Fameuse or Snow-apple of Canada, dark red skin, white, crisp meat, and of delicious flavor in that cold climate is merely commonplace when grown in Massachusetts, and the Manila grown mango throws our best Hawaiian grown mangoes into the second class. We are in many cases unfortunate here either from improper cultivation or a wrong selection of locality, and not a few of the tropical fruits grown here are inferior to the same fruits grown in Central America or the East Indies; but this should incite us to renewed exertion, farther experiments and doubtless better results.

As my list is a long one I will take it up without longer preface. *Anona* of the family Anonaceae.

A. cherimolia, the purple cherimoya of Peru. Of this there are two varieties, one smooth, the other with a tubercle on each scale. The pulp is a soft, sweet mucilage. I do not know of any trees of this species bearing on these islands.

A. squamosa, the Custard apple of Central America. This species has long been cultivated on these islands, and the first I ever tasted was in the garden of Rev. Oramel Gulick at Waiohinu, Hawaii, forty-two years ago. It has run wild over the southwest part of Hawaii. As the custard-like pulp contains no acid it seems tasteless to many, but is good food for invalids. In India it is claimed that when the tree is pruned in the hot season the fruit of the succeeding crops is of double size.

A. reticulata, called Bullock's Heart from its shape and reddish-brown color. The soft sweet pulp is not much esteemed.

A. muricata, the Sour Sop, grows well in Honolulu, and in Guatemala is a favorite fruit. The acid and strongly flavored pulp is disagreeable to many persons, but enough like it to cultivate it more than any other variety of this genus. A cluster of three fruits, from the Punahou region, weighed 15 pounds, a size exceeding any I have seen in Central America.

Garcinia mangostana, the Mangosteen of the family Guttiferae, is found on the Malay Peninsula and in the Moluccas; its northern limit is 14° at Tenasserim, and its southern at 7° S. I have tried it in my garden and so have others, but when it fruits the result is almost worthless, and I do not believe it can be grown on this group unless by grafting on the native allied genus *Calophyllum*, the native Kamani, it might be rendered hardier. Heat and moisture throughout the year seem essential to its growth. Many species of this genus are edible and produce gum gamboge, but this species is considered the most palatable of all fruits. The tree is handsome, I have seen it in perfection in Singapore, with dark green opposite leaves and the fruit is a drupe two inches in diameter with an outer fibrous covering dark red or purple on the outside but crimson within; the pulp enveloping the seeds is snow-white and of most delicate flavor. In Malacca it fruits in July and December. If a Luther Burbank could develop a variety that would grow in our hot, moist valleys, it would be a great boon to us.

Mammea americana, of the same family, the Wild Apricot of South America, is grown here and I have eaten a good fruit here from the St. Louis garden. The fruit weighed 35 ounces. Perhaps the *M. africana* might do better; its fruit is pronounced delicious by those who have tasted it.

Hibiscus sabdariffa, of the Malvaceae, the Roselle of the gardens, is peculiar in that the thickened calices form the fruit, which makes an excellent sauce, resembling that of cranberries.

Durio zibethinus, the Durian of the family Malvaceae, has been grown on both Maui and Kauai. It is found in the Moluccas and extends as far as Mindanao in the Philippines, but its native place is the Malay Peninsula, the home of the finest of the tropical fruits, where it is a lofty tree, the flowers being arranged in clusters on the trunk and older branches, and the fruit is as large as a small melon, covered with rough points. This falls, when

ripe, disclosing five lobes of a creamy consistency and whitish color in which the seeds are embedded. It is in season in May and June, but there is often a secondary crop in November. It must be eaten fresh as it soon decomposes. The smell is nauseous to most Europeans. The trees grow in clumps and a single clump will scent a whole village. In taking it to market, the fruit is hung in baskets on the top-masts of the boats. The extent of its range and its climate is about the same as that of the mangosteen, but it will endure almost any soil. All attempts to cultivate it in Hindustan have failed.

Averrhoa carambola, of the Oxalidaceae or Sorrel family, a native of the Moluccas, grows well in Honolulu, but is not duly appreciated by the whites. The tree is handsome with its feathery foliage, and the five-angled fruit, yellow when ripe, has a pleasant odor and a most refreshing acid taste,—too acid indeed without sugar. The juice contains hyperoxalate of potash. Sliced and stewed it makes an agreeable sauce of peculiar flavor, and in this climate we have too few small fruits like currants, gooseberries, etc. There are two varieties, the acid and the sweet, but the latter is inferior. Propagated readily by seed.

Averrhoa bilimbi, the Blimbling, is a larger species, quite acid, used in India for sauce, curries, pickles and preserves. I have eaten it preserved in India, but have not seen it here.

Skimmia japonica, family Rutaceae, might grow here and would be a desirable small fruit.

Citrus, another genus of Rutaceae, is a most difficult genus for botanists, at any rate they do not agree on the nomenclature of the different species, and find difficulty in referring the innumerable varieties to definite species. I need here give little more than an enumeration of the principal divisions of a subject on which Risso and other horticultural botanists have published folio volumes.

Citrus olivaceiformis, the Kumquat so well known as a Chinese preserve, but not enough appreciated for its adaptability as a dwarf ornamental tree, so often seen in China and Japan. The round variety is common in our gardens and is both ornamental with its golden balls which persist so long, and is admirable for orangeade and preserves.

Citrus medica, the Citron. I do not know how much of the preserved rind of this orange we import, but if profitable the tree would no doubt grow here.

Citrus limonum, the lemon, certainly grows well here, but is attacked by the purple scale which is often fatal. I have a tree in my garden which bears abundantly fruit of the finest quality; large branches of it have been layered and removed farther up Nuuanu valley, where they also are doing well. Why should we import lemons?

Citrus acida, the lime, as we all know, grows well all over the group, especially well in Puna on rather poor soil, but in spite of that limes cost more in Honolulu than in Boston, and those we get from Mexico do not compare in size and quality with those from Honduras. I have purchased delicious and juicy limes as large as the average lemon at Trujillo for one dollar (Mexican) per barrel. The people plant the tree in hedges, keep it closely trimmed and it bears constantly. Could not our Board of Agriculture get us some of these plants?

Citrus limetta, the Sweet Lime, is a common fruit in Central America, but not attractive to those who like limes or lemons. Without the acid its flavor is flat.

Citrus bigaradia, the Seville or bitter Orange, is used for flavoring rather than as a fruit. The skin is used for the Curaçoa liqueur and the flowers to perfume oil of Neroli; the peel is also candied. One acre has produced £50 worth of flowers.

Citrus aurantium. I do not know that the Syrian orange sold in the streets of Jerusalem and Cairo has ever been tried here, but it is generally considered by good judges of fruit the king of oranges. It is large, juicy and without much pulp, while the flavor is delicious. The so-called Coolie orange of India and China is close-skinned, like our Kona orange, and perhaps better in flavor. The St. Michaels orange, a flat yellow variety from the Azores was in my boyhood the favorite orange sold in Boston, as most of the Fayal trade was with Boston. I believe it a fact that one tree has produced 40,000 fruits in a season.

Citrus decumana, the Pumelo from which come the Shaddock, Forbidden Fruit, Grape Fruit, etc. To me this is the chief of the citrus family, but we never see here the famous Amoy pumelo. In China this fruit has been cultivated from time immemorial, and

it is mentioned in the time of Yu, who may have been a cotemporary of Noah. The Amoy grown fruit is most highly valued and has pulp red as a ripe watermelon, and as attractive in taste as in looks. The name Grape Fruit was given to a smaller variety from the West Indies by Boston marketmen from its resemblance and taste to the Malaga grape, which was formerly imported in great quantities into Boston. Excellent Grape Fruit has been raised here, almost as fine as some from southern California. Pumeloes also do well here, but in some cases the tree dies young after a few crops. Those at the Lunalilo Home, planted by Judge Dole, are of good age and show no signs of failure; the fruit is of good quality.

Three fruits belonging to this same orange family should be tried here if this has not already been done; they are the three following:

Ægle marmelos, the Beal or Beel. The fruit is green outside, yellow inside and very delicious when ripe. Mr. Jared Smith assures me that he has seen this fruit here.

Cookia or *Clausena punctata*, the Wampu of China, where it is a popular fruit, although small.

Glycosmis citrifolia, also a small but well flavored fruit.

Of the family of Rhamnaceae, not noted for its edible fruits, we have one species grown here, but which is made little use of as a fruit. I refer to the Jujube or *Zizyphus jujuba*, a handsome tree, not uncommon in gardens, with a small green fruit like a crab apple. This is seldom eaten raw, but yields the paste of the confectioners. Worth cultivating for ornament or for the wood which is hard and valuable.

Vitis vinifera. I do not know what variety of the grape Manini the Spaniard cultivated for the wine he made in early days, but I suppose it to have been the Mission grape as that flourished here in the early sixties and I have had fine bunches from the Princess Victoria's place on the Queen street shore, as it was then. They were also growing on the Knudsen place on Kauai. At present the Isabella seems to have driven out all others, although a few years ago my old friend Gonsalves, the Portuguese gardener, brought me a splendid bunch of Tokay, sweet and well colored.

Cupania sapida, of the family Sapindaceae, usually called Akee

has an edible aril and is an attractive tree much cultivated in Central America.

Nephelium litchi, the well-known Chinese dried fruit, grows well in Honolulu, but is a slow grower and does not bear until ten or fifteen years old. The tree in the Afong garden is still the largest and probably the oldest and has been bearing many years. The fresh fruit is excellent, and brings a very high price in the local market. A variety differing from this fruited last year at Punahou (Fig. 1), and another is said to have been introduced that bears in less than ten years from planting out. Smaller in size, but more delicate in flavor is the other (of the many known species) that is grown here, the Dragon's Eye (Fig. 2) of the Chinese, a fruit that plays an important part in Chinese worship and is greatly prized.

Nephelium longana is a handsomer and larger tree than the Litchi, and the russet colored fruit hangs in large clusters like grapes. It grows readily from seed and should be cultivated more than at present. Unfortunately it bears on alternate years, and as all the trees at present in bearing were of the same age, some one must pick the blossoms and so throw the tree into the odd years.

Pistacia vera, of the family Anacardiaceae, yields the Pistachio nut with a bland, oily kernel, much used in confectionary. The tree is fifteen to twenty feet high and a native of Afghanistan. One hundred and forty tons of this nut are annually imported into India from Kabul by the Bolan Pass. It should grow on the higher lands of this group.

Mangifera indica, the Mango of the same family, need not be enlarged upon in this list as a very comprehensive paper on this fruit has been published here. I need only say that having tried good fruit in both the East and West Indies I think the former superior. It may, however, be noted that there are many wild varieties in India eaten with relish by the natives that would not be liked by any European taste.

Anacardium occidentale, the Cashew Nut, is cultivated here to some extent and is readily grown from seed. It is a native of South America and as a fruit is curious rather than delicate. The nut, which yields an oil finer than olive oil, is outside of the swollen stem which is the fruit. The nuts are roasted and are then considered a good but rich food.



FIG. 1.--LONGAN FRUIT. *Nephelium longana*. Grown by Dr. Brigham.



FIG. 2. -LITCHI FRUIT. *Nephelium litchi*. Variety grown at Punahou.

Spondias dulcis, the Vi or Wi, the Tahitian quince, is well-known here and grows well from Hawaii to Kauai. While some are very fond of this fruit others consider it a very inferior one. The fructification varies considerably; some seasons the fruit is numerous in clusters, but small in size, at others there will be but a few fruits in a cluster, but they will be large. Another species is common in Guatemala and might well be introduced here.

Spondias lutea, a plum-like species. The tree in Guatemala grows to considerable size, and as even large branches when stuck into the ground readily take root the tree is much used for fencing. The fruit is either yellow or orange and very juicy. From the juice a good cider is fermented, that has considerable intoxicating power although the dose must be considerable to produce the hilarious effects I have seen among the Guatemaltecan peasants. The seed bears a remarkable resemblance to the peanut pod when dry. I have tried several times to procure this valuable tree for these islands but without success.

Tamarindus indica is well grown here, both for its fruit and wood. It belongs to Leguminosae.

Arachis hypogaea, the ground nut, is of the same family, and was formerly cultivated on the other side of this island with some success.

We come now to a number of genera of the Rose family, Rosaceae, one only native, but most of the others tried with more or less success on these islands.

Prunus amygdalus, the almond. My first sight of this fruit was in the garden of a Frenchman in Kalihi, more than forty years ago. I have forgotten the name of this hospitable man, whose garden I stopped to inspect, and who compelled me to stay to luncheon; but the almond was more strongly impressed on my memory. The trees were growing well.

Prunus persica, the peach. The stock that does best on these islands is said to be of Chinese origin. It does well as far up the slopes of Mauna Loa as Ainapo, and if properly trimmed is very satisfactory in Nuuanu valley. I have for years cultivated several varieties, but of late years have cut down my trees as the police were powerless to protect me from fruit thieves, the curse of this

place for fruit growers. Peaches were stolen before they were ripe, when other fruit was untouched.

Prunus armeniaca, the apricot, I have seen growing both in Dr. Hillebrand's garden and farther up Nuuanu valley, but I do not know that they have fruited.

Chrysobalanus icaco, the Hog Plum of the West Indies, should grow on our shores, and it makes a very agreeable preserve, although I have not tasted the fresh fruit.

Parinarium campestre or an allied species is found in the islands of the western Pacific and is noted not only for its gum which is used to calk the native canoes, but for the edible and nutritious kernel of the fruit. It was described by Mendaña when he discovered the Solomon Islands.

Rubus hawaiiensis, the Akala, is a well known but not a very fine fruit common in the forests of the uplands of Hawaii. The fruit is yellow or red and very acid; stewed it is more palatable. Another raspberry has been introduced from Japan. I do not know its specific name, but it has been thoroughly naturalized near the volcano and on the road above Olaa. This is not much better as a fruit than the native berry, but its fecundity is so great that it might be worth while to try to improve it.

Fragaria chiliensis, the wild strawberry, was introduced at some unknown period, and was formerly very abundant around the Volcano House and indeed all over the uplands of Hawaii, but the wild hogs have nearly extirpated this desirable berry.

Fragaria vesca, the common strawberry, is cultivated mainly by the Chinese here and the quality does not improve. Some raised at Wahiawa last season were, however, very fine, the best I have seen on the Islands.

Cydonia vulgaris, the Quince, might grow on the uplands, near the volcano.

Photinia japonica, the Loquat, grows well enough, but the quality of the fruit is very variable according to locality. When well-grown it is a good fruit, perhaps as good as any from Japan.

Pyrus malus, the Apple, fruits here but the strange growth of the tree shows it is not at home. I have eaten apples grown in Honolulu, when fruit was not imported from the Coast, that were

not bad, but the cultivation is hardly to be thought of in face of present importations.

Terminalia catappa of the family Combretaceae, the Umbrella tree, often miss-called kamani, is common in gardens, but the nut, which is highly prized in the islands of the western Pacific, is seldom eaten here. The kernel is quite palatable.

The Myrtle family yields us almost as many fruits as any other. To this family belong our *Metrosideros*, *Eucalyptus*, *Barringtonia* and other trees as well as the following fruits:

Psidium guajava, the common guava, which has become thoroughly naturalized on all the islands.

Psidium cattleyanum, the Strawberry Guava, both red and yellow. The manufacture of charcoal from guava wood by the Japanese is becoming more important than are the fruits. It is perhaps impossible to state the amount of charcoal made from this source, but I seldom meet less than two large wagon loads daily in driving from town to the Museum.

Eugenia malaccensis, the ohia ai of the natives, the mountain apple of the whites, is one of the few native fruits. It looks better than it tastes, but I cannot find that it is any better in the East Indies where it also grows or is native. Several allied species are cultivated here, Rose Apple, etc.

Eugenia jambolana, the Java plum. This myrtle grows rapidly and bears several crops in the year, but is not regarded as a very good fruit. In the East Indies it is much more highly esteemed, both as a fruit and as medicinal. Properly boiled the fruit yields a good syrup.

Eugenia piperita, Barbados cherry, a shrub easily propagated and growing rapidly. It is very ornamental even when not covered with its white inflorescence, and the lobed fruit which varies from scarlet to deep crimson when ripe, is juicy and wholesome. Its quality varies greatly in cultivation; if neglected it becomes small and insipid.

Eugenia uniflora (?), the Spanish Cherry, is a favorite fruit with those who know it. My first introduction to it was on a tree in Pauoa Valley planted by Manini (hence the name Spanish). It does look like a cherry with its long stem, and the blossom still more strongly resembles the inflorescence of

that fruit. Unfortunately it does not keep long and must be eaten from the tree.

Bertholletia excelsa, the Brazil Nut. There are two Brazilian trees that certainly deserve notice if not cultivation, the *Bertholletia* and the *Lecythis*, and strangely there is no record that I can find of the cultivation of either in foreign lands. The nuts are exported to the Eastern States and to Great Britain. Those of the former are known as Brazil nuts, those of the latter as Paradise or Sabucaia nuts. They are somewhat similar as both are packed in a wooden case, six inches in diameter and half an inch thick. The rather large nuts are packed within this strong box so closely that it is impossible to replace them when once removed. The tree of the present species is one of the tallest in the Brazilian forests; whether we have a sufficiently rich vegetable soil I should doubt.

Lecythis sabucaja, *Lecythis otiaria*, these two species produce similar nuts and are desirable trees if they can find a rich valley bottom, well watered and sheltered, and the fruit would not only enrich our dessert, but be easily exported to supply the Pacific Coast, as it comes already packed.

Punica granatum is raised in many gardens, but as an ornament, for there is less use of the pomegranate than there should be. In southern Europe it is largely consumed, and it is growing in public esteem in the Eastern cities.

Passiflora edulis, the purple fruited Passion flower has become naturalized on Hawaii and Kauai, known by its native name lili-koi. In the Colonies it is seen in all the markets, and as it keeps well even when wrinkled as a raisin, has a long season. The fruit is not only refreshing, but is a very popular flavoring for ices. The vine is hardy and prolific.

Passiflora quadrangularis, the granadilla here is a large fruit, (I have raised them seven pounds in weight) and very delicious. There is a variety much smaller and round, but of the same flavor. This vine is very prolific, bearing several crops each year. The blossom is handsomer than that of *P. quadrangularis*.

Passiflora laurifolia is the Water Lemon of the West Indies. Not common here.

Passiflora maliformis, the Sweet Calabash, is often called Water Lemon here and Granadilla in Central America. It is common in our markets in the early summer, the lilikoi being an autumnal fruit.

Carica papaya is like the Passion flowers, a native of tropical America, and was probably introduced here in early days. Wild ones abound in the Guatemaltecan forests on the Pacific coast. The Hawaiian ruit as we all know varies greatly in quality, but the better sorts are not surpassed anywhere. Either fresh, as a breakfast fruit, or baked in slices with plenty of lime juice, it is a palatable fruit.

Curcubita moschata, the Musk Melon, has almost disappeared as a native product. Cantaloups were in former years brought in abundance to our doors, but they soon became inferior, as the Chinese gardeners sold all the finest ones and kept only the smallest unmarketable ones for seed. I tried importing good seed and distributing it to the Chinese, and for a season the results were good, but they soon fell back into their old ways, and now the trouble seems to rest in a worm that all our entomologists do not seem able to cope with.

Citrullus curcubita, the Watermelon, also needs selection; the average quality does not seem as good at present as it was forty years ago. In India it is claimed that seed of the melon is improved by keeping four years. I do not know that any one here has tried the experiment. As the seeds are eaten they are certainly better a little dried.

Opuntia tuna of the Cactus family, the Pa bipi of the Hawaiians, we have both in the red and the greenish-white varieties of the fruit: both become larger and more pulpy under cultivation. Eaten and liked by the Indians of tropical America, here they are generally left for the birds.

Coffea arabica. . . Coffee of the family Rubiaceae may be classed with fruits as the berry at a certain stage of ripeness is juicy and sweet with a little coffee flavor. The berry of *Coffea liberica*, although larger is not so juicy. Time and again, when riding through the coffee plantations of Guatemala, I have found refreshment in the red berry of the former.

Morinda citrifolia, the Noni of the Hawaiians, would hardly be

classed as a fruit by Europeans, but is used as a medicine and was once eaten by the natives.

Vaccinium reticulatum, the Ohelo, is a Hawaiian fruit of a very different character. It flourishes high up the mountains in poor soil, often growing in mere cracks in the rocks like its relative, the blueberry of Canada, and loses most of its good qualities when it ventures towards the coast on some lava stream as is occasionally seen in Puna. The allied *Gaylussacia resinosa*, or huckleberry of New England, I once tried to introduce here, and Judge Dole, then a law student with me in Boston, undertook to plant on the mountains of Hawaii a quantity of seeds I had prepared, but I have never seen any signs of these and fear they did not take kindly to the soil.

Chrysophyllum cainito, the Star Apple of the Sapotaceae, grows well here and there are a number of trees about Honolulu. The fruit certainly looks well, but is not of a decided flavor, although some like it very well.

Achras sapota, the Sapodilla, is by many considered a good fruit, and is popular in the West Indies. There are trees of this fruit in Honolulu.

Lucuma mammosa, what is called sapote in Guatemala and Mammee-apple in the West Indies, does not belong to the genus *sapota*. It is a fruit with a rough leathery outside, the meat reddish surrounding a smooth nut, and the whole flavored with cinnamon. I have seen some sapotes as large as a coconut but usually they are not half that size.

Diospyros kaki, the Japanese Persimmon of the Ebenaceae, is, I think better preserved than fresh. I have seen it fruiting admirably in the rich bottom lands north of Sydney, N. S. W., and as it is also cultivated in Burma, this handsome fruit might do well here. It is often in our markets from southern California.

Diospyros mabola, a native of the Philippines, is often improperly called mangosteen. The fruit is brown, about the size of a quince, and is pink colored within. Those who have tasted both consider this species better than the Japanese one. All the trees of this ebony family that will grow here would be desirable for the timber, which always commands a high pricee.

Olea europea, the Olive, has 21 Spanish and 13 French varieties. One tree at Villefranche produced in good seasons from 200 to 230 pounds of oil. On the Australian coast the tree does well: I have seen there mere bushes planted in the public grounds at Adelaide, bearing profusely, and on the other hand I have a tree of the most esteemed variety from Sta. Barbara planted in my garden in 1896 forty-two inches round a foot from the ground, and thirty-five feet high, that has never even blossomed. The general opinion has been that the olive will not fruit on these islands, but I am glad to hear that Wahiawa, which brings us so many good things, has fruited olives of good quality. Another species, *Olea paniculata*, is frequently cultivated here for ornament, and fruits readily, but these are not edible. Neither is the fruit of the Chinese favorite, *Olea fragrans*, which should be better known here for its fragrance which pervades whole villages in the flowering season and gives flavor to many a chest of tea.

Solanum nodiflorum, the Popolo, is eaten by Hawaiians and cultivation might render it more agreeable to European taste.

Lycopersicum esculentum, the Tomato, or as it was called when first brought from tropical America, little more than two generations ago, Love Apple, was cultivated as an ornamental plant, later as a vegetable, until it has won its way to the position of a dessert or salad fruit. The small globular variety has run wild in these islands and is a pleasant subacid fruit.

Physalis peruviana, the Poha, still another of the *Solanum* family, attains its greatest perfection on the high plateau of Hawaii around the ruins of the Ahua Umi.

Piper Betle of the Pepper family is allied to the Awa and certainly is not a fruit, but a leaf, still in combination with the fruit of the Areca palm it forms a delectable mixture used by almost the entire Malay race.

Myristica fragrans, the Nutmeg, grows well in Honolulu and a fine tree stood in the garden of Judge John Montgomery—now the St. Louis School. Unfortunately the people of the school, not knowing what it was, cut it down to make room for some school building.

Persea gratissima, the Palta or Avocado Pear, of the Laurel family, is now commonly cultivated all over the group. The fruit

varies greatly in quality and in some places the trees, while not old, seem to be dying out.

Aleurites moluccana, the Kukui, produces a nut too rich to be eaten as a walnut, but exceedingly palatable when roasted as in the *inamona* of the natives.

Phyllanthus distichus, the Tahitian Gooseberry, is a shrub with small reddish flowers followed by a roundish, subacid fruit the size of a marble. A desirable small fruit which I do not think has yet been cultivated here.

Morus alba, the white Mulberry; the fruit is small and sweet; originally introduced for food for silkworms.

Morus nigra, the Black Mulberry; the fruit is readily forced by trimming and is not unlike the Black Cap Raspberry of the Eastern States.

Morus atropurpurea of China produces a very agreeable berry two inches long, and in great quantities. Why not cultivate this in preference to the *alba* and *nigra*, which were planted here for silkworm food?

Ficus indica, the Fig. It seems unnecessary to enlarge on the cultivation of this useful fruit, which here is mostly in the hands of the Portuguese, but I may call attention to the profit that might be in curing the white or Naples fig, which grows freely, bears heavily and the fruit dries without decay on the tree. Dried, these figs bring (or did some years ago) double the price of Smyrna figs; they also are not tough skinned and insipid like the Californian dried figs.

Artocarpus incisa, the Bread-fruit, is rather a vegetable than a fruit, and is planted for ornament rather than produce. As the old gardens fall into the hands of the Orientals the breadfruits come more and more into the market.

Artocarpus integrifolia, the Jack, is also an ornamental tree, and although the fruit grows to a considerable size on the north coast of Hawaii, the fruit value is very inferior. In Singapore the immense fruit is filled with white seeds surrounded by a yellowish transparent jelly of foul smell, but agreeable taste, so that those who have no sense of smell (a larger proportion of civilized mankind than is generally supposed) can happily enjoy the Jack-fruit.

Ananas sativa, the Pineapple of the family of Bromeliaceae, is largely cultivated here and ranks well as a fruit. Some that I sent to Boston were pronounced by judges familiar with West Indian pines, superior. The pine growing wild in Kona, Hawaii, is small but of excellent flavor.

Bromelia pinguin, the wild pine of the uplands of Central America, is juicy and attractive as it forms hedges by the wayside.

Zinziber zerumbet, the Ginger, cannot be called a fruit, as the rootstock is the important part, but it is when preserved decidedly a sweetmeat, and seems to be always on the sideboard of a Chinese gentleman. Many species of the ginger family flourish in these islands, some have become naturalized, and I am surprised that our Chinese with the lessening profit from their rice fields do not cultivate ginger for preserving.

Musa sapientum, the Banana. There is need of importing better stock than the Chinese if we are to compete with the West Indian bananas in the San Francisco market. The people there will not be always satisfied with the poor fruit we are now sending them. There was a time when the red banana was the principal kind in the Boston market; it is now rarely seen there, and in Guatemala it is fed only to the hogs.

Musa paradisiaca, the Plantain. The difference between banana and plantain is often not understood, and some suppose that all plantains are cooking bananas. Persons who have raised both species can tell at a glance from the habit of the tree, but the simplest distinction is that while the banana ripens its fruit from the top of the bunch, the plantain ripens from the bottom. Also plantain bunches are much smaller than those of the banana, that is have fewer hands, and for that reason plantains are sold not by the bunch, but by the hundred. At the port of Livingston, Guatemala, while a bunch of fine bananas of twelve hands sells for fifty cents, plantains are quoted at \$1.25 per hundred. The latter is supposed to have a greater food value. On the Pacific Coast as at San Jose de Guatemala, magnificent plantains grow a foot long and of proportional diameter. These are not unlike in taste to our *maia maoli* of the Kona coast of Hawaii.

Cocos nucifera, the Coconut, certainly does not flourish on these islands, and as a fruit is very inferior. Still, as it is, we do

not avail ourselves of all it offers. In India no curry is complete without it: in Honduras fish is boiled in the "milk" to its great improvement, but these are only suggestions of some of the 500 uses of this most useful of nuts. It is true that some of the nuts from the southern islands have been planted but these are not yet visible in the market.

Cocos Weddelliana or *Wedellii*. A palm cultivated in some gardens that bears an edible fruit of good flavor. I cannot identify it having seen only the fruits.

Phoenix dactylifera, the Date. Although this palm grows well and fruits abundantly (a young date palm in the Kamehameha School grounds this year bore twenty bunches weighing from twenty to twenty-five pounds each, when not yet fully grown, or more than 450 pounds to the tree,) the fruit is generally worthless, at least compared with the excellent dried dates I have eaten in Egypt, and which with parched corn made a good day's ration for a traveler.

Areca catechu, the Betel Palm, grows well here and bears abundantly; not being a chewer of betel, I cannot speak of the quality of the fruit for mastication.

Pandanus odoratissimus, the native Lauhala. This and other species afford important food to many Pacific islanders, but can hardly be called good fruit.

Monstera deliciosa, the last in my list, is by no means the least. To my own taste it far surpasses the pineapple, but is an awkward fruit to eat as it ripens by degrees taking several days. Belonging to the Kalo family, it is a curious exception to the usually hot or acrid fruits of the arums, but cultivation is doubtless the explanation of its large highly flavored fruit. In Central America it grows luxuriantly, but the scarce fruit is not attractive. With me the more luxuriantly the vine grows the more abundant and better the fruit, which takes more than a year to ripen.

Upon the conclusion of the paper an open discussion took place upon the cultivation of tropical fruits in Hawaii generally. Mr. W. W. Hall, after complimenting Dr. Brigham upon the interest and utility of the data which he had compiled, referred to the excellency and quantity of the Hawaiian grown oranges which were obtainable in Honolulu forty years ago. These he described as being exceedingly juicy and of a flavor which imported oranges

never possess. This fact he attributed very largely to the fact that oranges from other countries were necessarily plucked before their full flavor was developed, but it was a characteristic which gave to the Hawaiian orange a superiority in the home market over all others. In his youth, the speaker reported, the oranges from Waiālua and Kona were particularly in evidence, and both were of excellent quality. The Waiālua oranges were generally of golden yellow color, while those from Kona were of a characteristic russet color. In Mr. Hall's opinion the Hawaiian orange of years gone by was far more acceptable than the modern mainland product.

Dr. Brigham spoke in support of Mr. Hall's appreciation of the oranges to be obtained in former years. He well remembered one tree in particular, remarkable alike for the excellent flavor of its fruit and the facility with which it could be separated from the rind. In one season this tree, which belonged to Father Bond at Kohala, had produced as many as ten thousand oranges.

Mr. Jared Smith said that the original oranges from which the present California oranges were evolved were in many ways similar to the old Hawaiian ones. As a rule although exceedingly juicy and of good flavor, such oranges possessed a very large number of seeds which had been bred out by systematic selection. If he remembered correctly the original fruit from which the Florida oranges have sprung contained as many as 85 seeds.

Mr. Emmeluth reported that there were still a great many excellent oranges grown in the islands, but for some reason they seldom found their way into the market. While on Kauai last season he had been struck with the quality of some fruit he had seen and had arranged for a box of assorted varieties to be sent to him in Honolulu. Upon arrival he found they had evidently not been properly packed, as they were loose in the box and many were in bad condition. He had endeavored to obtain another consignment of the variety he had liked most, to reach Honolulu in time for the present meeting, but unfortunately it had not yet arrived.

Mrs. Nakuina said that many of the Molokai gulches produced quantities of excellent oranges. She had often remarked that after a dry season the fruit was not only small and poor, but full of pips, while after plentiful rain it was juicy and comparatively free from seeds. The reason the fruit was not shipped to Hono-

lulu was that difficulty had been experienced in packing it in such a way as to allow it to arrive in the market in good condition. Much of the fruit was allowed to rot on the ground in consequence of this.

Judge Dole informed the last speaker that in order to insure the arrival of citrus fruit at the market in good condition a process called "sweating" was necessary. This was more or less elaborate according to the fruit, but with oranges it merely consisted in placing them in ordinary orange boxes which are so constructed as to allow free evaporation on each side. The fruit was usually picked from the trees and placed in the boxes where it remained for about two days. During this time the fruit exuded considerable moisture, chiefly from the rind which became drier. After two days the fruit was removed, allowed to dry and repacked. The process required for lemons was more difficult to operate successfully. The speaker suggested that in view of the very general interest in the subject it would be well if the Hawaii Experiment Station should make known the method of sweating citrus fruit for market.

Mr. Webster related that while in Florida he had visited the orange packing establishments. The fruit was placed upon large tables down which it rolled. At the bottom were holes of different sizes. The small ones were encountered by the fruit first, and through these the smaller fruit passed. In this way the fruit was graded into various sizes. Before packing each separate fruit was wrapped in paper. The boxes were filled until about one layer projected above the sides, when the lid was nailed down. In this way the oranges remained firmly held together and after undergoing certain shrinking did not shake in the box. In northern States, apples were subjected to much the same process, being packed in barrels until well above the sides when slow pressure was imposed until the top could be fastened down.

Mr. Weinrich informed the meeting that he had frequently seen citrus fruit in large quantities going to waste in orchards little removed from the market. He regarded it as a reproach that such a state of affairs should exist and instanced the case of a large sugar plantation which, after going to considerable expense in planting fruit trees, lost interest and allowed them to perish from neglect.

Mr. Austin, whose work as inspector of fruit importation allows him to speak authoritatively, said that he had kept a careful account of the citrus fruit which entered this port from California and found that its gross value amounted to about one hundred thousand dollars per annum. If the Territory could only be made to appreciate the money it was expending on the Coast in preference to keeping it at home, this condition of affairs would not continue.

Mr. Hall said that he would like to make known the result of an experiment he had made upon a fig tree which grow on his land at Pearl City. The tree in question had been unproductive for some years, but he had lately well pruned and fertilized it with the result that its last crop had numbered at least twelve hundred fruits. In one day he had picked two hundred figs and there had been sufficient fruit from this one tree to supply two or three families besides his own. Even the mynah birds had partaken without appreciable effect on the supply.

Mr. Austin informed the meeting that fig trees produced their fruit on the new wood and that judicious pruning not only stimulated the tree, but increased the available fruit producing twigs. Peach trees might be treated in the same manner with success.

Mr. Roberts recommended that those people whose trees did not bear so well as Mr. Hall's, should try a device for frightening away the mynah birds from fruit trees, which he had tried with success. After removing the bottom from a number of beer or similar bottles he corked them and passed a string through the cork to which were attached inside the bottle a few nails. When these were suspended from the trees the action of the wind caused them to emit a continuous tinkle which aroused the suspicions of the birds and kept them at a distance from the trees.

The following paper was then read:

THE FOOD VALUE OF TROPICAL FRUIT.

BY DR. EDMUND C. SHOREY.

When I was assigned the task of preparing a paper on this subject several questions were asked me which showed that on several points there was a possibility of difference of opinion. These questions may be summed up in two; what is fruit and what is food?

Taking the latter question first—what is food. Food in the general sense may be taken to mean anything that is taken into the digestive system of man or animals, either to satisfy hunger, or to excite pleasurable sensations through the taste. In this sense the term food is used in laws regarding adulteration; food in this case including drinks and condiments. The more scientific or exact definition of food is that it is that which supplies material for growth, replaces the waste of the body or furnishes the energy by which the body performs its functions, or the work necessary for its existence or mode of living.

With regard to the functions of food probably the first thought is that it is that which furnishes material for growth, increasing the size or weight of the body. This, however, is not its chief or most important function. In all living animals there is through the mere act of living a waste of tissue. The involuntary action of the muscles of the heart, whereby the blood is circulated; the almost involuntary action of the muscles which produce respiration, can only take place through destruction breaking down or change of composition of the tissues. No man, however lazy, can live without work is true in the most extreme sense, and to supply material to replace tissue destroyed in this work food is necessary. Even "father" of the popular song who "lies around all day" probably found it necessary to take some nourishment. In addition to these unconscious or automatic exertions which accompany the mere act of living most of us find it necessary to do various and sundry acts known as work or labor. This work whether it be the mental effort necessary in the preparation of a paper for the Farmers' Institute; the vibration of the vocal cords of a candidate for election addressing an audience; the tension of the muscles of a road laborer as he rests on his pick or hoe handle; in short any motion or use of any part of the body is the result of decomposition or breaking down of tissue. This tissue must be renewed or the capacity for work ceases. This renewal is effected by food. What then is food? How does material which is food differ from that which is not?

We have in nature what we call forces or sources of energy such as heat, light, electricity. These forces can be transformed one into the other, for example the heat of burning coal becomes transformed through the steam of the boiler into the motion of the engine, then into the motion of the dynamo and finally into the light

of the arc lamp. Among other sources of energy is that of chemical combination. A chemical compound in the production of which energy has been used is simply a storehouse of that energy and can under proper conditions be made to give it up again; the giving up resulting in decomposition whether it be a simple compound or a complex group as in the tissues of living animals. In attempting to make this clear allow me to draw a parallel. The heat of the sun is one source of energy. This heat causes the surface water of the ocean surrounding us to be continually vaporized. This water vapor, when the upper strata of the atmosphere can hold no more, is precipitated as rain. Some of this rain falls in Nuuanu Valley and finds its way into the reservoirs. The water in these reservoirs is in virtue of its position, several hundred feet above sea level, capable of doing work; in fact does work or is made to generate electricity and light our streets. The stored water represents simply some of the sun's energy and today we need no Joshua to command the sun to stand still for we can bottle up the sun's energy by day and have it on tap by night when and where we please.

Sunlight is another source of energy. Growing plants by a complex and little understood process make use of this energy and build up by it out of the carbonic acid of the air and simple nitrogenous compounds obtained from the soil the complex organic compounds characteristic of plants. Practically all the essential parts of plants represent stored up sunlight just as reservoir water represents stored up sun heat; and just as stored up water can be made to do work by letting it flow to a lower level so the complex compounds of plants can be made to do work by letting them down so to speak to a lower level, decomposing them into simpler forms. Foods then are such higher level compounds, and every act or motion of living animals is simply the setting free of energy, which at some time has been stored up by plant from that given out by the sun. Of course all plant products are not food. Some are not digestible, such as woody fibre, the energy of which can be set free by burning. Others are simple compounds which have been already reduced to a lower level during the growth of the plant.

Chemically food material has been divided into three general groups: I. Protein, the nitrogenous compounds. II. Carbohydrates comprising sugars and starches, and III. Fats. For

the economical production of work whether in man or animal these three must be furnished in proper proportions. Protein is the most important as neither of the others can replace it.

Turning now to the question, What is fruit? we have, of course, the botanical significance of the term as that part of the plant which bears the seed whether a head of wheat, a pumpkin or an orange. The term fruit, however, is never used in this sense popularly and while there are a large number of plant products which every one speaks of as fruit, there are also quite a number about which there might be a difference of opinion. For the purpose of the present paper I will adopt an empirical definition and include as fruit those fleshy seed bearing plant products which are eaten simply for their agreeable taste as an accompaniment to or to give relish to other food.

As tropical fruits of this character I offer the following short list leaving out a large number peculiar to the tropics, but which are seen or eaten by but few persons. This list would include oranges, lemons, limes, pomelos, bananas, pineapples, grapes, figs, guava's, mangos, avocado pears and olives. It might at first sight, in view of the definition of fruit I have adopted that fruits have no food value, that they are simply agreeable accompaniments to other food. Analyses, however, of these fruits show that they have some food value and as man's digestive system is ordinarily constituted the mere intention of the eater makes no difference in the destiny of the material eaten. If the material eaten has food value it will be utilized.

In considering very briefly the composition of these fruits we find that water is a large constituent. Of those mentioned all except olives contain more than 75%. Oranges and pineapples contain nearly 90%. This large water content necessarily makes the possible food value low, but in this respect they are about on the same footing with fresh vegetables. Of the important constituent protein the amount present is small. Olives contain 2%, figs 1.5%, grapes and bananas 1.3%, avocados 1.0%, oranges 0.8% and pineapples 0.4%. Fats, of course, are absent except in the case of olives and avocados. It is in the carbohydrate group, the sugars, that we find the chief food value of the fruits mentioned. We find that bananas have 21%, grapes and mangos 15%, oranges 11% and pineapples 8%. In short there is throughout a general similarity in the composition of fresh fruits and fresh suc-

culent vegetables which may be stated generally as consisting in a large amount of water with the food value depending chiefly on the carbohydrates.

Many fruits owe their agreeable character to the acids present, and no doubt these acids have a hygienic value in maintaining healthy conditions. How far this is true with an ordinary mixed diet it is impossible to say.

We often hear of fruitarians and the dietaries of a number of these have been studied especially in California, but it must be remembered that these so-called fruitarian diets are really a combination of fruit and nuts; the nuts furnishing the protein and fats lacking in the fruit. Combinations of this kind can be made which are well balanced and which furnish all the energy necessary, but I am among those who believe that man was built for a mixed diet and that the world's work is being done and will continue to be done by individuals and nations subsisting on such a diet.

A great deal of nonsense has been written about the food value of certain fruits, especially bananas. Taking the protein content of bananas as 1.3%; to furnish 100 grams of protein per day the amount necessary for an adult man it would be necessary to consume about thirteen and a half pounds; an amount which I imagine it would be difficult to consume many days in succession and which would furnish a large excess of carbohydrates. In short it is simply an impossibility to maintain a healthy existence on fruits alone; either because the amount necessary to furnish the requisite energy is too large for consumption or because a ration so constituted is not balanced.

Viewed as class, fruits of the tropics or sub-tropics do not differ essentially from those of the temperate zone, and speaking generally their food value is somewhat the same as that of fresh vegetables. With regard to Hawaiian fruits in particular not many analyses have been made. Such analyses as are available do not indicate any material difference in composition from those grown elsewhere. The few figures I have given have been taken from published average analyses.

In summing up this short consideration of the food value of fruits I would say that there is no reason why they should not be considered more as actual foods than as pleasure-giving accessories, and where the cost will allow should have a more prom-

inent position in the diet of many, combining from a dietary standpoint pleasure with profit.

After the reading of Dr. Shorey's paper the secretary handed to each member present, a sample of sun-dried mango, which had been prepared by Mr. Harry Roberts. The fruit was well received, nearly all who tasted it pronounced it excellent. Upon being requested by Mr. Smith as to the process of drying, Mr. Roberts reported that the fruit he had used was that of the ordinary mango. It was first peeled and then sliced—about five slices being yielded by one fruit. It was then placed upon trays in the sun to dry, care being taken to allow free circulation of air. No sugar was used, and after two days the fruit was placed in double paper bags. Mr. Roberts thought that mangoes dried in this way might perhaps be placed on the mainland market to be used in the same way as dried apples. He thought that the trees on his own premises could produce a thousand pounds of dried fruit each year.

The third paper of the evening was then read:

FRUIT CULTURE AN INDUSTRY IN HAWAII.

BY JARED G. SMITH.

Special Agent Hawaii Experiment Station.

A recent editorial in one of the leading fruit journals of the mainland summarizes the development of the fruit trade of the United States and draws from this summary the conclusion that the consumption of fresh fruit by the people of the United States is increasing in a ratio out of all proportion to the increase in population. In other words the people of the United States are fruit eaters, and the market is limited only by the quality of the fruit offered, and by the purchasing ability of the people who buy. The fruit consumption of the mainland amounted to upwards of \$140,000,000 during the fiscal year 1905. The value of the orchard fruits was estimated at \$85,000,000; of berries and small fruits \$20,000,000; of tropical fruits from Mexico, Cuba and other Spanish-American countries \$25,000,000; \$2,000,000 worth from Hawaii and Porto Rico and about \$8,000,000 worth from foreign countries. The strawberry crop alone was valued at \$15,000,000 and the sum invested in fruit baskets, boxes and crates amounted to over \$7,000,000.

The development of the tropical fruit trade between Hawaii and the mainland depends in the first place upon the quality of the fruit offered; second, the style and method of packing for shipment; third, upon the efficiency of the transportation service between Hawaii and the mainland, and fourth, upon advertising, in order to bring home to buyers the merits and excellence of the Island products.

The Hawaii Experiment Station inaugurated shipping experiments in 1904 with alligator pears and mangoes. A number of crates of both of these products were shipped in cold storage to New York City, the larger portion arriving in marketable condition, although some were a complete loss. The commission merchants who received our fruit stated that the pears which came through in good condition were of better style and quality than alligator pears sent to the New York markets from the West Indian ports. Another shipment was made to the Philippines per Government transport and these were reported as having been received in sound condition. Although experiments were repeated in 1905, only a small part of the pears reached destination in good condition. On August 1, 1906, Mr. J. E. Higgins, horticulturist of the Station, shipped about five tons of pineapples, papaias, bananas and alligator pears to San Francisco, himself accompanying the shipment, in order that he might make personal studies of transportation, packing, handling and marketing Hawaiian fruits. I have just received a report from Prof. C. C. Georgeson, director of the Alaska Experiment Station, acknowledging the receipt of a case of pineapples. This particular case did not reach him in very good condition, but he expresses surprise to find out that the Alaska market is only 25 days from Honolulu. Other crates of fruit were shipped to Portland, Tacoma, Seattle, Spokane, Helena, Reno, Salt Lake City, Denver, Omaha and Washington, D. C. Practically the entire consignment was marketed and distributed outside of California. With the exception of the Alaska shipment favorable reports have been received in regard to the condition of the whole consignment.

Upon Mr. Higgins' return he will undoubtedly be able to report to you in greater detail in regard to the practical points connected with the shipping and marketing of Hawaiian fruits.

The creation of a demand for fruit is of as great importance as the economical production of the fruit itself. When we con-

sider that the people of the mainland not only consumed \$105,000,000 worth of home grown fruit, but paid an additional \$35,000,000 for tropical and sub-tropical fruits, the often repeated prediction that Hawaii is liable to glut the market if production continues unchecked, becomes almost an absurdity. I will lay it down as a law, that good fruit, and especially good tropical fruit, can always be sold in the American markets at good prices, if laid down at the point of consumption in first-class condition. The mainland consumption is increasing at the rate of \$20,000,000 a year, and as stated above bears no relation to mere increase in population. The Pacific coast market is nearer to Hawaii than the London market is to Jamaica, and yet the fruit trade of Jamaica has increased during the last ten years to such an extent that it is now the principal industry of that island. I believe that the fresh fruit trade of the Pacific North West coast is capable of almost indefinite expansion, and belongs more justly in so far as bananas, pineapples and alligator pears are concerned to Hawaii, than to lower California, Mexico and Central America, which countries are already reaching out for this trade. Whether Hawaii can take and keep the Pacific Coast market for tropical fruits depends very largely on the push and enterprise of Hawaiian fruit-growers.

After some interesting discussion upon Mr. Smith's paper, the reader announced that the success which had been achieved by Mr. Higgins upon his visit to the mainland to investigate the conditions upon the Coast for marketing Hawaiian fruit and giving them publicity, had been so encouraging, that although the present would ordinarily terminate the Institute's meetings for the year, in view of the importance of the subject, with the consent of those present a special meeting would be held in order to allow Mr. Higgins to report upon what he had achieved. This proposition met with general agreement and it was determined to hold another meeting in about two months, when Mr. Higgins will have completed his work and will have returned. As the hour was late, upon motion of the chair it was decided in view of the absence of the author to defer the paper upon insects affecting the fruit industry until the special meeting. Mr. D. L. Van Dine had prepared a number of mounted specimens for exhibition and it was felt that more justice could be done to this important subject when it could be presented by the author. The meeting then adjourned.

ENTOMOLOGICAL NOTES.

From the Division of Entomology, Board of Agriculture and Forestry.

BY JACOB KOTINSKY.

THE RECENTLY INTRODUCED DUNG FLY PARASITE.

(*Eucoila impatiens*, Say.)

In his search for useful insects for the Territory Mr. Koebele is now concentrating his attention on the horn fly, taking enemies of our other pests, as Avocado pear scale and cut worms, incidentally. Nearly every steamer from the coast brings a large consignment of these insects for breeding and distribution. On the 5th of May, of this year, the "Alameda" brought, among other things, a box with dipterous pupae collected in dung. They were packed in sphagnum moss and kept at about 40° F. aboard the steamer. In the laboratory they were gradually brought to our normal temperature and then segregated and put away for breeding. A little less than a month later males and females of the above named parasite began to issue. They were immediately supplied with a large jar full of cattle droppings well stocked with dipterous larvae and pupae habitually inhabiting it. As fast as other specimens of the parasite issued they were placed in this jar. Twenty-five days later a large brood of the parasite made its appearance in the jar and systematic distribution among ranchmen on the Islands and at the heads of the valleys in the vicinity of Honolulu immediately commenced. A portion of the brood was retained and two fresh jars stocked with it for further breeding and distribution. So far as we are aware all stock breeders on the Islands, with the exception of a few, have by now been supplied with colonies of the useful insect. The material from which this lot of parasites was bred was collected by Mr. Koebele in the vicinity of Alameda, but it has also been bred from pupae more recently received which Mr. Koebele sent from Nogales, Arizona.

For naming the fly we are indebted to the U. S. Bureau of Entomology, Washington, D. C., where it was named by Dr. Wm. H. Ashmead.

DESCRIPTION.

The insect was originally described by Thomas Say in the Boston Journal of Natural History, vol. I, page 268, 1835, as *Figites impatiens*, from specimens collected in Indiana. This description is copied below for reference and is given in smaller type so that those not specially interested may omit reading it.

"F. Impatiens.—Black: mandibles and feet piceous.

"Inhabits Indiana.

"Body polished black: antennae piceous-black, two-thirds the length of the body, with scattered hairs: beyond the sixth joint moniliform: terminal joint ovate conic: mandibles piceous, area of the stemmata a little elevated: behind which, on the occiput, are oblique impressed lines: scutellum with the margin depressed and rugose, the disk oval, the edge obscurely piceous, with an indentation behind, within the edge: wings hyaline: nervures yellowish: feet piceous.

"Length three-twentieths of an inch."

Any one who has first observed the males and females will not confuse them again, as the antennae of the former are about three times as long as those of the latter, this being the most conspicuous character.

BEHAVIOR.

The insect flies readily and also moves about in the dung with perfect ease. The female is armed with an ovipositor nearly as long as the entire insect. This organ is normally hidden in the body and is withdrawn when eggs are laid. When extruded it curves forward beneath the body and pierces through substances while reaching out for its host within which one or more eggs are deposited. Both larva and pupa of dung flies are attacked nor is preference shown for any particular species of fly, provided it is a dung inhabitant. The egg so laid hatches within the host and the resultant grub feeds and grows at the expense of the host substance surrounding it. It reaches maturity within the latter's integument and when fully formed emerges through the aperture made by gnawing off an end of the pupa. The fly larva even when parasitized attains the pupa state so that the parasite invariably issues from that state of the fly. The parasite is so large when compared with the horn fly pupa that it was doubted at first whether the latter would be subject to attack, but upon confinement with pupae of this fly it was observed to oviposit in them and the parasite was subsequently bred from them.

NATURE AND EXTENT OF USEFULNESS OF THE PARASITE.

It is now beyond doubt that the parasite does and will attack the horn fly larva and pupa in its way, though it will probably show preference to the larger hosts breeding in the same medium. But even in the latter event it cannot but prove useful, both directly and indirectly. Directly by reducing the numbers of the larger flies that inhabit cattle droppings. Indirectly by reducing the numbers of the larger maggots and pupae as a source of food to the mynah bird and other predators and thus compelling them to feed on the smaller fry, including horn fly larvae and pupae. No opportunity was yet open to ascertain whether the parasite has been established on the Islands, but judging from the facility with which large numbers were bred in confinement the certainty of its ultimate establishment on the Islands is a safe assumption. Once established much of the success of its introduction will depend upon the intelligent manipulation of the various ranch managers and owners in distributing parasitized pupae over their respective lands.

A CORRECTION.

Advantage is here taken of calling attention to a serious typographical error that appeared in the last (1905) "Proceedings of the Hawaiian Live Stock Breeders' Association," on page 77. For the first line beneath the illustration on that page read "This antana enemy (Fig. 8) was *not* introduced by Mr. Koebele." Other errors of similar nature abound in the author's notes in that publication, but since these notes are to reappear in identical form in the forthcoming report of the Board, with errors corrected, they will not be referred to here.

RICE HARVESTING MACHINERY.

We are in receipt of some excellent illustrations together with a description of the recent experiments which Mr. F. G. Krauss of the Hawaii Experiment Station has been lately conducting with rice harvesting machinery. The whole will be published in the November issue.

REPORT ON HORTICULTURAL QUARANTINE
INSPECTION WORK.

To the

Honorable Board of
Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:

Since my report to you, dated August 8th, I have the following brief summary of the work of my division:

On August 6th the S. S. "Hong Kong Maru" arrived from China, having on board twenty-five (25) boxes of rubber stumps (*Hevea Brasiliensis*) from Ceylon, consisting of 30,000 plants that had been over five months detained in a warehouse in Colombo and on the voyage, so that upon their arrival here they were dried up and were in such bad condition that the importers abandoned the consignment and it was put up for sale by the Custom authorities on August 15th and bought in by me for five dollars. After fumigation and destruction of the soil, those showing any signs of life were planted in the Government Nursery and now nearly 300 give evidence of growing.

During my vacation—kindly granted by you—Mrs. Craw and I spent two weeks at the Volcano House on Hawaii and had a most enjoyable and beneficial outing.

On my visit to Hawaii I spent two days at Hilo with Mr. Matthias Newell. Previous to my going up to the Volcano House I gave instructions regarding the construction of two fumigating outfits for Hilo, one for the dock and the other for the post-office, and in the event of any infested plants or seeds arriving there, will be treated by Mr. Newell.

During my absence Mr. Kotinsky assisted Mr. Austin along the front in inspection work. The S. S. "Miowera" arrived on August 21st and a passenger from Fiji had a collection of choice seedling sugar cane cuttings, that were found to be infested with leaf-hopper eggs. The cane was fumigated to destroy any insects that had hatched on the voyage. The cane was subsequently burned as there was grave danger of fungi diseases being present. I have to endorse the action of the above named gentlemen in preventing the possible introduction of fungi diseases in sugar

than most other pests and certainly more difficult to combat.

During this time Mr. Kotinsky has been industriously breeding and distributing colonies of beneficial insects for horn flies, also others preying upon scale and other injurious insects. Several valuable colonies of useful insects have been received from Prof. Koebele, collecting in Arizona, and now in Mexico. Other useful insects have also been received from Mr. Compere from China and are being attended to by Mr. Kotinsky.

Since my return Mr. Austin and I have been almost constantly employed in the fumigation of large importations of infested rice from Japan (15,736 sacks). Carbon bisulphide was successfully used in tight fumigating rooms on the quarantine wharf after which the rice was put through the polishing machinery. An extra strong application of hydrocyanic acid gas was applied in one large room, but was not as successful as the carbon bisulphide and had to again be treated with the latter fumes. The rice importers cabled instructions to their agents not to ship any more rice unless it had been treated or put through the mill. The only lot received since was a few thousand sacks on the delayed S. S. "Mongolia" that had sailed before receipt of the cable instructions.

The Collector of Customs, under instructions from the Secretary of the Treasury, withheld delivery of the rice until it was thoroughly fumigated.

Since my last report fifty-five (55) steamers and sailing vessels arrived in port from outside the Territory, bringing one hundred and thirty-four thousand five hundred and ninety-four (134,594) packages of fruits and vegetables. This does not include the 15,736 sacks of rice we fumigated. During the same period we inspected one hundred and thirty-seven (137) packages by mail. The reason for this large invoice by mail was the receipt of fifty (50) packages of Cacao plants from the Department of Agriculture, Washington, D. C., and thirty-five (35) packages of sisal plants, (210) from the same place. The former had been treated with Bordeaux mixture, but had some living mealy bugs; these and the sisal plants were fumigated here with hydrocyanic acid gas. Four (4) large cases of plants also came in and were carefully inspected and fumigated.

Respectfully submitted,

ALEXANDER CRAW,
Superintendent of Entomology and Inspector.

BY AUTHORITY.

Notice is hereby given that **G. H. Moore, Esq.,** has been appointed Assistant District Fire Warden for Nuuanu and Pauoa Valleys, District of Kona, Island of Oahu.

C. S. HOLLOWAY,
Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., Oct. 19, 1906.

Notice is hereby given that **E. E. Conant, Esq.,** has been appointed District Forester and District Fire Warden for the South half of the District of Kohala, Island of Hawaii.

C. S. HOLLOWAY,
Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., Oct. 19, 1906.

Notice is hereby given that **John T. Moir, Esq.,** has been appointed District Fire Warden for that portion of the District of Hilo, Island of Hawaii, extending from the land of Makahanaloa to the land of Kikala.

C. S. HOLLOWAY,
Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., Oct. 19, 1906.

Notice is hereby given that **Augustus F. Knudsen, Esq.,** has been appointed District Forester and District Fire Warden for the District of Napali and that portion of the District of Kona, formerly known as the District of Waimea, lying to the West of the Waimea, Poomau and Kauaikanana Valleys, Island of Kauai.

C. S. HOLLOWAY,
Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., Oct. 16, 1906.

Notice is hereby given that **Francis Gay, Esq.,** has been appointed District Forester and District Fire Warden for that portion of the District of Kona, lying between the Waimea, Poomau and Kauaikanana Valleys on the West and the Hanapepe Valley on the East, Island of Kauai.

C. S. HOLLOWAY,
Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., Oct. 16, 1906.

Notice is hereby given that **Walter D. McBryde, Esq.,** has been appointed Co-District Forester with Rev. M. Lydgate for that portion of the District of Kona, lying to the East of the Hanapepe Valley, Island of Kauai.

C. S. HOLLOWAY,
Secretary, Board of Agriculture and Forestry.

Honolulu, T. H., Oct. 16, 1906.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Shower, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haugh, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.
Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.
First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.

Second Report of the Board of Commissioners of Agriculture and Forestry for 1905; 240 pp.; plates 8; text figures 8.

"Notice to Importers," by H. E. Cooper; 4 p.; 1903.

"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.

"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

"The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.

* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.

"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.

"The Japanese Beetle Fungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp., cut; 1905.

DIVISION OF FORESTRY.

* "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.

"Suggestions in Regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.

"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.

"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.

DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.

"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.

"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.

"Out of Print.

Any one or all of the publications listed above (except those marked *) will be sent to residents of this Territory, free, upon application to Mailing Clerk
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The Company's liability under this form of contract might be \$20,000 or possibly \$70,000, if my daughter should live to be as old as some of her ancestors.

Yours very truly,

IRVING W. MARSHALL.

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VOL. III.

NOVEMBER, 1906.

No. 11.

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THE HAWAIIAN FORESTER AGRICULTURIST

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No. 11

The organization of various local improvement societies throughout Honolulu some months ago was instrumental in effecting a great advance in the standard of street and lot appearance of the city. The fostering of civic pride can be achieved in no more direct way than by the encouragement of a friendly emulation to enhance the beauty of natural resources. Attendant with the awakening of a pride in the beauty of environment follows a train of beneficial results which go far to the development of a country's material prosperity. Among those which are most readily suggested, may be mentioned the encouragement of an appreciation of natural beauty, leading to the development of higher ideas, the widening of the intelligence and mental horizon, and the inculcation of principles making for contented and happy homes.

During the past month, among other advances in local improvement which have been noted, the planting of the avenue of golden shower trees on Pensacola street, and the clearing of the vacant lot near the entrance to Punahou College—a work which is still in progress—are particularly to be commended. We trust that the excellent progress which has already been made will steadily continue until our city may be in fact, the most beautiful of the tropics. In this, as in almost all other work, there is no time of final accomplishment, but each new year and generation must carry on what has been so well begun.

The work of the Hawaii Experiment Station ranks among the chief factors which are making for the stable prosperity of the agricultural industries of the Territory. In connection with the experiments now being undertaken to develop a new breed of rice suited to the peculiar needs of the islands, and to improve the local cultural and harvesting methods of the rice crop, we present this month a series of illustrations together with a descriptive letter from Mr. Krauss, who is conducting the investigations, which should prove of exceptional interest to our readers.

A system of cultivating vacant lots has, for some years, been in operation with excellent results in certain mainland cities. According to this plan a "Vacant Lots Cultivation Association" is formed of such people as are interested in the movement and desire to help it forward. The association takes over for cultivation and improvement all vacant lots from owners in sympathy with the work, on an agreement to surrender them upon demand. The association then prepares the ground for cultivation and allots it to desirable tenants. It also exercises supervision over the gardeners, provides them with seed and fertilizer (in the form of street sweepings), sells or in some cases lends them tools, offers them general advice when needed, and also reserves the right to take away any lot which does not come up to the standard of efficiency and appearance or whose tenant does not work in harmony with his neighbors. The gardeners receive the use of their land without payment subject to the surrender agreement, and are entitled to the whole produce of their labor. The system referred to is productive of an "intense" system of horticulture, in which every foot of available ground is rendered productive. If this system were inaugurated in Honolulu it might be deemed advisable in some neighborhoods to restrict the gardeners to flower growing, but in any case the plan would be beneficial with respect to many vacant lots which are more or less outside the present local improvement societies. The land not far from the Young Hotel, covered with a labyrinth of wooden fences, would certainly look more attractive if it were filled with brightly colored flower beds. Many other lots now lying idle could be greatly improved and be made remunerative to such citizens as have sufficient energy and application to work them properly. "The best way to give assistance is to do so in such a manner as to teach self-help," and it is one of the many important lessons of life that the most severely overburdened individuals can learn to help themselves. The greatest help could be given by teaching the Hawaiians to help themselves. The Hawaiians are proverbially dependent on others, and this is one of the reasons why many whose chief support comes from the United States Government are paupers. To many of our native-born citizens the idea of working for money is new, and to those who have no money they are unable to enter the market, and to those who have no money to buy foodstuffs they are obliged to eat regularly what is left over from the previous day's dinner.

RICE HARVESTING MACHINERY.

Honolulu, Hawaii, Oct. 21, 1906.

Mr. L. G. Blackman,
Editor The Hawaiian Forester and Agriculturist,
Honolulu.

Dear Mr. Blackman: As per your request, I enclose herewith negatives of two rice harvesting scenes—Chinese harvesting rice by hand, and a self-binding harvester in operation in our trials, October 18, 1906.



At this second trial of the rice harvester by the Hawaii Agricultural Experiment Station, with conditions in the field not so favorable as they often are, it having rained the night previous to the trial, and also during part of the time while the machine was in operation, very satisfactory results were achieved.

The particular machine used in our trials is what is termed a McCormick Self-binding Right-hand Rice Harvester, with five-foot cutter-bar, a machine especially designed to meet the requirements of rice growers in Louisiana and Texas. It is largely due to this labor and time-saving implement that the rice industry of the Gulf States has been so greatly extended and made profitable.

The rice-binder does not differ materially from the ordinary grain binders used throughout the United States. The main wheel is somewhat higher and broader and in addition is provided with long lags to secure the necessary traction in soft, yielding soil, and such parts as are directly exposed to the mud and water of the rice fields are galvanized to prevent rusting.

The harvester used in our trials cuts a swath five feet wide, but machines making six and seven-foot cuts are commonly used in the Southern rice belt. Two to three strong horses are required to draw the smaller machines, while as many as five horses are used to the larger machines, depending upon the stand of grain and condition of the ground.

One man drives and operates the harvester, which cuts the standing grain at any desired height, gathers it into bundles of desired size and ties each securely with a band of manila twine, collects the bundles in a carrier and dumps them in piles of three, four or five. A man or two following shocks the bundles to dry and cure.

The binding mechanism on the modern self-binder is a marvel to all first beholders. As the cut grain falls upon the platform canvas, it is delivered to the binding attachment, between the elevator canvases,—the butts of grain are evened as the packers quickly gather the grain into bundles, and the curved needle darts in a half-circle round the tightly clasped





bundles, a perfect knot is tied and the well-rounded sheaf is discharged to the carrier from where it is dropped to the ground at the will of the operator.

Under favorable conditions, the five-foot cut machine will cover five to eight acres a day, which is equivalent to the hand labor of twenty-five to forty men.

While not adapted to all Hawaiian rice fields, our last trial has demonstrated that on such lands as can be drained sufficiently to permit of horses keeping a comfortable foothold, the modern self-binding harvester can be made a useful aid as a time and labor saver.

Very truly yours,

F. G. KRAUSS,
In Charge of Hawaii Rice Investigation.

BY AUTHORITY.

ARBOR DAY PROCLAMATION.

In accordance with the custom inaugurated last year of setting apart a day for the promotion of forest growth, I hereby designate Friday, November 2, 1906, as Arbor Day for the Territory of Hawaii, recommending that appropriate exercises be held in the public schools and that a part of the day be devoted to the planting of trees and shrubs upon the school grounds.

(Seal)

Given under my hand and the Great Seal of the Territory of Hawaii, at the Capitol Building in Honolulu, this twelfth day of October, A. D. 1906.

G. R. CARTER,
Governor of Hawaii.

REPORT OF HORTICULTURAL QUARANTINE
INSPECTION WORK.

Honolulu, T. H., October 31st, 1906.

To the Honorable Board of Agriculture and Forestry,

Honolulu, T. H.

Gentlemen: During the month of October seventeen (17) steam and sailing vessels arrived from outside this Territory on which we found thirteen thousand, five hundred and fifty-one (13,551) packages of fresh fruits and vegetables, seven (7) cases of plants, two (2) barrels of seed and fifty-four (54) packages of plants and seeds by mail. A few lots found attacked by fungi diseases or insect pests have been destroyed or fumigated with carbon bisulphide or hydrocyanic acid gas.

Since my last report, October 3rd, we have fumigated three thousand three hundred and fifty-eight (3,358) sacks of old crop rice, using fumes of carbon bi-sulphide. The above chemical was exhausted in town owing to the previous heavy fumigation of infested rice and a fresh supply arrived ex S. S. "Hilonian" on October 21st.

On October 9th Mr. C. J. Austin, after repairing the orchard fumigation outfit, commenced the treatment of the scale infested Moanalua Indian mango trees that were imported four years ago and planted without fumigation. The fumigation of the trees was done at night on account of less danger by actinic rays; even with that precaution a slight injury was done the very tender foliage; this, however, was not lasting as since the fumigation the trees have all put on a healthy vigorous new growth, and on careful examination we failed to find a single living scale.

On October 20th Mr. Kotinsky received a twig of "Norfolk Island pine" from Kauai infested with small "*Araucaria scales*" (*Pseudococcus aurilanus*). Mr. Kotinsky replied and made inquiry regarding its introduction and received a reply that he had received a few small *Araucaria* trees from a nursery in the East and from a firm in San Francisco and is of the opinion that it was on the latter trees the scale came by mail. The owners dipped the two small trees in "whale oil soap" solution.

He again sent samples of a twig to which Mr. Kotinsky replied on October 30th, "that all the scales on the twig were dead, from which I conclude your dipping in soap solution was effective." The next visit of one of your entomologists to that island a thorough inspection will be made to see that it has been completely exterminated there.

From Japan came fourteen small tea plants on which I found traces of a white wax scale (*Ceroplastes*); after destroying any that had evidence of that scale the others were fumigated with hydrocyanic acid gas and will be held in quarantine to watch developments.

A Customs inspector intercepted a small package of rolled pearl barley being taken from the Japanese training ship "Aragawa." Acting Collector Stackable notified me and Mr. Austin and I visited the training ship and looked through the stores and found the above grain infested with "rice weevils" (*Calandra oryza*). We brought the matter before the officer of the day and he issued orders to the sailors and members of the crew not to take any of that barley ashore. This is a cosmopolitan beetle and is found on the Islands.

Mr. Kotinsky makes the following report upon beneficial insects received from Prof. Koebele during his recent explorations in California, Arizona and Mexico:

May 5, 1906. Consignment No. 19.

Name.	Enemy of.	From.	Disposal.
Chalcid	(Mealy bug) ..	Alameda, Cal.....	Bred.
Coccinellidae	(Mealy bug) ..	Nogales, Ariz.....	Bred.
Histers	(Horn fly)	Nogales, Ariz.....	Released.
Proctotrupids.....	(Horn fly)	Nogales, Ariz.....	Bred and released.
Scymnids	(Mealy bug) ..	Alameda, Cal.....	Bred.

May 25, 1906. Consignment No. 20.

Scymnids	(Mealy bug) ..	Alameda, Cal.....	Bred and released.
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August 11, 1906. Consignment No. 21.

Dung maggots.....	(Horn fly)	Alameda, Cal.....	Bred and released.
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August 29, 1906. Consignment No. 25.

Calosoma sp.....	(Cut worms) ..	Nogales, Ariz.....	Released.
Histers and larvae...	(Horn fly)	Nogales, Ariz.....	Bred and released.
Manure beetles.....	(Horn fly)	Nogales, Ariz.....	Released.

September 7, 1906. Consignment No. 27.

Calosoma sp. (Cut worms) .. Nogales, Ariz. Released.
 Chilocorus cacti. (Scale bug) ... Nogales, Ariz. Released.
 Exochomus pilatei. ... (Mealy bug) .. Nogales, Ariz. Released.
 Manure beetles. (Horn fly) ... Nogales, Ariz. Released.
 Histers and larvae. ... (Horn fly) ... Nogales, Ariz. Bred and released.
 Horn fly parasites. ... (Horn fly) ... Nogales, Ariz. Bred.
 Phanacus (†) sp. (Horn fly) ... Nogales, Ariz. Released.

September 19, 1906. Consignment No. 28.

Amara sp. (Horn fly) ... Nogales, Ariz. Released.
 Calosoma sp. (Cut worms) .. Nogales, Ariz. Released.
 Chalcaspis sp. (Mealy bug) .. Nogales, Ariz. Released.
 Hemerobiids. (Scale bug) ... Nogales, Ariz. Bred and released.
 Histers and larvae. ... (Horn fly) ... Nogales, Ariz. Bred and released.
 Horn fly parasites. ... (Horn fly) ... Nogales, Ariz. Bred.
 Hyperaspis lateralis. (Scale bug) ... Nogales, Ariz. Released.
 Manure beetles. (Horn fly) ... Nogales, Ariz. Released.
 Syrphus flies. (Scale bug) ... Nogales, Ariz. Released.

September 28, 1906. Consignment No. 29.

Amara sp. (Horn fly) ... Nogales, Ariz. Released.
 Chalcaspis sp. (Mealy bug) .. Nogales, Ariz. Released.
 Hemerobiids. (Scale bug) ... Nogales, Ariz. Released.
 Histers. (Horn fly) ... Nogales, Ariz. Released.
 Manure beetles. (Horn fly) ... Nogales, Ariz. Released.

As requested by you a public exhibition of some of the principal beneficial imported insects—enumerated above—was made. They were arranged in an exhibit case by Mr. Kotinsky and space was kindly given by Messrs. McInerny in one of their windows, corner of Merchant and Fort streets, where they attracted general attention of the residents and visitors to Nogales.

Very respectfully,
 J. H. CRAW,
 District Inspector.

*WHAT RUBBER TREES CAN BE PLANTED IN
HAWAII?*

PEHR OLSSON-SEFFER, PH. D.

*Director, La Zacualpa Botanical Station and Rubber Laboratory,
Mexico.*

Ever since Charles Goodyear's discovery rendered the rubber of practical use to mankind the tropical forests have been scoured by the natives and by white men searching for rubber-producing trees. Along the Amazon River and its tributaries the seringueiro of Brazil hunts for the rubber of this immense territory, and he sometimes goes as far as the slopes of the Andes. In Peru, Ecuador, Colombia and Venezuela, a diligent search is made for rubber. All through the Central American republics and Southern Mexico, the native ulero taps the indigenous rubber trees which are now rapidly decreasing in number. In West and East Africa the negro collectors bring in immense quantities of rubber for the benefit of the white traders. In East India, the Malay Peninsula and on some of the South Sea Islands, wild rubber is collected. Everywhere, however, the amount is decreasing, that is, we should rather say the natural supply is not sufficient for the steady increase in the demand of crude rubber.

This fact, as well as the high prices obtained for rubber has induced capital to take an interest in the development of rubber planting as an industry. It is still more or less in the experimental stages, but sufficient results have been obtained to demonstrate that rubber planting, when conducted properly, is a very lucrative undertaking.

The question what rubber plants should be cultivated in certain localities must be determined, besides by the quality of the rubber obtained, by local and climatic conditions. It seems as if it would be rather difficult to make a choice from the great number of rubber yielding plants which are known so far. The concerns which have undertaken rubber planting are still so young that it is not possible to draw more than general conclusions from the results, except in the case of a number of rubber estates in Ceylon and the Federated Malay States, where accurate data can be secured.

Although many points have been advanced for the profitability of this or that rubber plant in preference to others still all information so far have been based on limited experience only. What rubber tree is the best to plant in Hawaii can naturally not be decided upon before more evidence has been obtained. We can only draw some general conclusions by comparing the climate at its different points here with those of other countries, where rubber cultivation has reached a more advanced stage, as well as with the conditions obtaining in places where the various rubber plants grow wild. The conditions under which a plant develops its natural surroundings give the observer a number of points that is always difficult to recognize correctly all such conditions, so that others can be compared with them. Any conclusions of this kind must be confined to districts in which similar conditions prevail, if they are to be in any way correct.

The natural rubber zone from about 25° North latitude to 25° South latitude, where rubber producing plants grow. Within this belt the general climatic conditions are more or less similar, although considerable variations sometimes are considerable. We can say that in this zone the temperature varies from 75° to 100° Fahrenheit, and that the average rainfall is about 80 inches. If we make a comparison between Hawaii and other rubber producing countries we find that this Territory is very close to the southern limit of the natural rubber zone. Roughly speaking, the islands are situated between 19° 10' and 22° 25' North latitude. Kauai, for instance, is located between 20° and 23° and it is very doubtful whether rubber can be grown profitably in this island. Oahu is situated between 18° and 20° North latitude and rubber has not yet been a success. Jamaica and Porto

Rico lie between 18° and 18° 30' and rubber culture there is of doubtful success. It has not been successful where tried. In the Philippines rubber is being grown commercially and the rubber at that place is

the rubber at that place is

the rubber at that place is

Malay Peninsula reaching from the Equator to about 10° North. In the Philippines, the Island of Luzon is situated between $12^{\circ} 20'$ and 18° . This island is generally not considered to be suitable for rubber, while Mindanao is referred to by the Manila authorities as the true rubber country. These data are not inducive to a favorable opinion as to the future of rubber in Hawaii. Still it is generally known that on account of the insular climate prevailing in these islands, most tropical plants succeed extremely well. It has also been demonstrated that certain rubber producing trees flourish in suitable locations in these islands and it may be safe to say that in a very few selected localities rubber will become a commercial success.

The question then arises which species of rubber is the most profitable to plant. We would without hesitation say *Hevea brasiliensis*. The Ceara rubber is the one which has been most extensively experimented with in these islands and its growth has been truly remarkable. Now, it is a fact, however, that the Ceara has been planted in locations with plentiful rainfall and under such conditions it always makes a good growth. As for the actual results in yield of rubber we must reserve our opinion until proofs have been obtained.

In a few places where *Castilla* has been grown in the islands the young seedlings are doing well, but this does not prove anything as regards its future. The *Ficus* of East India is not likely to become a rubber yielder in Hawaii, for many reasons. Even in its native country it does not produce rubber profitably before it has reached a rather advanced age, from 18 years upwards. It is further a native of a very warm tropical country. That it grows fairly well in certain places in these islands does not prove that it would be advisable to plant it for commercial purposes. It also grows in all parts all over the United States and Europe. It must reach a large size if it is to become commercially important. Another species of rubber which should be considered is *Sapium* *tolimense* of Colombia. This produces a good kind of rubber, and in a climate as it occurs naturally at an *The Hancornia*, which gives the is a very slow growing tree, difficultly be a success here.

Amongst rubber trees we find that the

planter in Hawaii has to confine himself to four species, the *Hevea*, the *Manihot* or Ceara rubber, the *Castilla* and the *Sapium*. We shall briefly refer to the requirements of the three former plants.

The main difficulty in establishing a *Hevea* rubber plantation is the matter of obtaining seeds. On account of the extensive cultivation now being made in Ceylon, and in the Orient generally, the demand for seed is very great and orders have to be booked months ahead. Then comes a long transportation during which the seeds are packed and the germination kept back. When the consignment finally reaches here it is found that a great number of seeds fail to germinate, and even when germination has taken place the development of the plant is for some time very slow. At Nahiku, on Maui, where a quantity of *Hevea* has recently been planted the growth of the seedlings was for a long time very slow, until the plants became thoroughly acclimatized. The best source for obtaining *Hevea* seeds for these islands is naturally Singapore.

As regards the planting of *Hevea* in Hawaii it would be advisable to plant rather close, say 10x10 feet. This will give opportunity for selection and from time to time a thinning of the inferior trees should be made. It will always be found to be more advantageous to plant close at a start than to have to replace failures. During the first years of its existence the *Hevea* tree grows mainly in length and its rapid increase in growth is not noticeable before the tree has reached an age of about three years. In Ceylon, a growth of about 6 to 10 feet in height every year for the first three or four years is considered the average. The circumference of the stem at three feet from the base in a two-year-old tree varies from 2 to 8 inches. A very important factor in rubber cultivation is the development of a good root system. In 6 to 7 years the lateral roots of trees planted at a distance of 10x10 feet may be expected to meet. If shade trees have been planted during the first few years these should give room for rubber alone as soon as crowding commences. The question of planting any catch crops between the rubber is still a debatable one. With the system of clearing which apparently is the best in Hawaii, that is strip clearing, no inter or catch crops could be grown.

The Para seedlings develop best if slightly shaded for the first and second years. After that time they grow satisfactorily with-

out shade. Windbreaks will very likely be necessary everywhere in these islands. As the native forest does not produce sufficient shelter, wind belts of *Grevillea* or *Albizzia* should be planted. It may be found advisable to plant *Albizzia moluccana* between the rubber trees and keep them pruned down so that the rubber at an age of two years will outreach the tops. In that manner the *Albizzia* would be covering the ground and at the same time supplying green manure to the soil.

In planting *Hevea* seeds in the nursery it is a good plan to add to the soil a mixture of cattle manure and leaf mold, in which case a much improved growth would be apparent. In Ceylon the young seedlings are attacked by a number of enemies such as rats, hares, etc. To keep these animals away the young plants are often enclosed in rabbit wire netting. When rabbit netting is used for individual plants they are surrounded by a circle of netting, about 6 to 9 inches from the plant and of a height of three or more feet. In making holes for the final planting of these seedlings it is a good plan to give the plant plenty of room. The larger the holes the better, as the *Hevea* is a very greedy feeder.

It is a well known fact that the *Hevea* does not necessarily require a very rich soil. This refers also to other rubber trees with the exception of *Ficus*. The main requirements as regards soil is good drainage and deep soil with sufficient subterranean water supply. It may be found that the Hawaiian soils are rather too acid and require liming. The question of fertilizing the soil for rubber is as yet unsettled as very few experiments have been made. When the cover of Para trees is once established the soil will keep on improving on account of the action of the roots and the natural accumulation of leaf mold. Green manure has been tried and the plants respond readily.

The superiority of *Hevea* above other rubber producing trees has been amply demonstrated in Ceylon. This tree is comparatively hardy and permits a system of tapping which invariably would destroy both *Castilla* and *Manihot*. The multiple tapping which is practiced on *Hevea* gives ultimately a considerably larger amount of rubber per tree than can be obtained from any other plant. From that point of view cultivation of *Hevea* is the most profitable. Tapping *Hevea* is, however, connected with much work and where labor is expensive this tapping becomes a serious item. In comparison the tapping of *Castilla* is cheap, because it

needs to be done only a few times during the season, and a proportionately greater amount of rubber is obtained at each tapping.

In regard to methods of cultivation *Castilla* needs the same care as *Hevea*. It is not necessary to sow the seeds in a nursery. Being comparatively cheap a larger number of seeds can be planted at stake and thinning done subsequently. Experience has proved this to be the best plan for planting *Castilla*. The tree can be easily propagated from cuttings, but seed plants are preferable as they are stronger and live for a longer period. Both *Hevea* and *Castilla* have to be pruned in order to secure single straight trunks with the largest possible tapping area. Both are almost equal in regard to injuries by insect or fungus attacks. In this regard *Ceara* rubber is more liable to damage. The young seedlings are attacked by numerous enemies as both roots and leaves contain a large amount of starch which is naturally sought for by various animals.

The seeds of *Castilla* are somewhat difficult to transport over long distances, but by packing in slightly moistened charcoal they can retain their germinating power for months. In obtaining seeds of *Castilla* it is important to know the origin of the seeds as there are many varieties of this tree which are non-productive or produce only a limited amount of rubber. The best variety is *Castilla lactiflua*, originally described from La Zacualpa, in Mexico. In sowing these seeds they should be only slightly covered with light soil. If planted too deep germination will be considerably retarded. *Castilla* can be planted at the same distance as *Hevea*, that is about 10x10 feet. Thinning has to be done from time to time.

There are very few localities on the Hawaiian Islands which seem suitable to *Castilla*. Where such conditions obtain, that is, where the temperature is about 74° Fahrenheit and the rainfall not more than 80 inches, the *Castilla* should do well. It cannot be grown profitably above an elevation of 500 feet and it requires good shelter as the leaves are very liable to injury from high winds.

In regard to *Manihot* seeds they are easily obtainable and can be held for several years without losing their germinating power. It has been proved that seeds kept in a dry place for two years germinate better and give stronger seedlings than recently picked

seeds. If not filed or prepared in other ways the seeds do not generally germinate for a long time. Sometimes they lie in the ground over a year. The generally adapted method to assist germination is to file the seed. This is very laborious and experiments have proved that the seeds can be made to germinate in eight days, by the following method:

Place a layer of fresh horse manure in a box, to the thickness of about 6 inches, spread the seeds on this surface and cover with about one inch of the same material mixed with a small quantity of sand. The soil should be slightly packed and the box covered with glass. If put in a warm place or in the sun germination will take place very quickly. The seedlings should be planted as soon as they are an inch or two high and some manure added to the soil. After such a treatment the seedling will grow very rapidly. In planting at stake the holes should be made as large as possible, or at least four feet square. The soil should be well weathered and if too sour some lime should be added before planting.

The *Cereia* rubber tree needs no special care besides the cleaning of the soil. In some instances the trees have to be pruned if branching too early. Generally it can be said in regard to any kind of cultivated rubber tree that it should develop a trunk 10 to 12 feet high before we allow branching. It is not practicable to tap higher on the trunk than above 8 feet and the sooner we allow the tree to branch the greater will be the growth in girth. It is after all the tapping area which is the ultimate goal in developing rubber trees for commercial purposes. We have therefore to encourage growth in the circumference of the tree.

If we were to lay down any rules as to suitable localities for the different rubber trees which can be grown in these islands we would say that in sheltered valleys with good drainage *Castilla* should be planted not higher than 500 feet above sea level. We can then plant *Hevea* on the slopes up to about 800 feet, and above this *Ceara* can be grown probably not higher than 1200 feet. If in the future *Sapium* can be demonstrated a success here this tree would probably be grown up to 2000 feet.

On account of the comparatively expensive labor in these islands it may be advisable to plant *Castilla* as above stated in suitable localities, because this tree needs less labor during the tapping than *Hevea*, which otherwise is the best producer. As for *Ceara* we are still in the dark regarding suitable methods of

tapping. It is to be hoped that this question will be settled during the experiments which are now being made in different places. In Ceylon the attention is being directed towards profitable tapping of the Ceara and a number of experiments are being made. The Bureau of Agriculture and Forestry of these Islands intends to make experiments in tapping Ceara in the small groves of this tree which were planted a number of years ago on the Island of Kauai. In Mexico similar experiments are being made on the only place where Ceara rubber has been planted in that country, the Esmeralda plantation in Chiapas. This last series of experiments is being made in connection with the La Zacualpa Botanical Station.

In summing up the points expressed above we would say that the area suitable for rubber cultivation in Hawaii is very limited; only four kinds of rubber are likely to succeed; the *Hevea* comes first, with the greatest yield of rubber, *Castilla* next, *Manihot* third, and *Sapium* is as yet untried; the limit of elevation for cultivation of these rubber trees in Hawaii ranges approximately as follows:

Castilla and *Hevea* from sea level upwards to 500 feet, the latter to 800 feet, *Manihot* up to 1200 and *Sapium*, not higher than 2000 feet. Great care is to be taken in obtaining the right varieties, and in planting under the right conditions.

POULTRY AND AGRICULTURAL EXHIBITION.

The Hawaiian Poultry Association will hold its Second Annual Exhibition of Poultry and Pigeons on Thursday, Friday and Saturday, December 20-22nd. The Farmers' Institute of Hawaii, the Board of Commissioners of Agriculture and Forestry and the Hawaii Experiment Station will also coöperate in the success of the undertaking. Besides the usual contribution of feathered stock, the bee-keepers will be represented, and there will be exhibits of silk culture, beneficial insects, fruits, flowers and ornamental trees. The exhibition will be held in the spacious skating rink on Queen street, not far from Messrs. H. Hackfeld & Co.'s building.

HORTICULTURAL INSECT ENEMIES.

BY D. L. VAN DINE.

Read by title at the Farmers' Institute of Hawaii, September 29, 1906,
accompanied by an exhibit of the injurious insects
of fruit trees in Hawaii.

As a fruit grower's aim is to produce fruit with a profit, his interest in "bugs" and "blights" is limited to the information that will enable him to prevent the destruction of such profit. The view-point is one of dollars and cents. The reason for Honolulu's door-yard trees and vines suffering as they do from their insect enemies, is not that Hawaii is especially visited by hosts of devouring pests not experienced in other countries, but rather that the pocket-book of the owners are not being hard hit. Let the raising of oranges or avocados become a man's only dependence for the bread and butter of his family and his contention for the profit with the insect enemies will become of some importance. Therefore we are not troubling ourselves to any extent over the oft-repeated statement that Hawaii *could* be a great fruit country *if* it were not for the "blights." Let the prospective fruit grower give to the problem of the insect enemies of his fruit trees, the same consideration that he must give to the selection of locality; preparation of the land; propagation and cultivation of the trees and vines; and harvesting and marketing the crop, and he will find the problem but one of many that must be solved by careful study and honest endeavor.

I could enumerate the many species of insects feeding on our fruit trees and vines and tell you their names, their peculiar characteristics and habits, their injuries and twenty other "theirs," but we do not remember details not of immediate interest to us, therefore I will try to help you to help yourselves, when the time comes when you do need the details. The supposition will not be that you have gone to the Government Nursery, received a tree for nothing, had your yard-boy put it in a place never suited for a fruit tree, and then left it there to act as a breeding place for its insect enemies, but, rather, that you contemplate raising some sort of fruit for profit and would learn its insect enemies and how to control them.

It is man's convenience that makes one insect noxious and the

other beneficial. In cultivating plants for fruit, as in all other lines of cultivation, we are trespassing certain laws of nature, and the increase of the plant feeding species of insects is one of the difficulties resulting therefrom. To off-set this disturbance, the fruit grower must be prepared to protect his trees from the ravages of insect enemies, or wage war against them if they have already gained a foothold in the orchard. To do this intelligently and with economy of time and expense, something must be known of insects in general and the insects injurious to fruits in particular.

WHAT AN INSECT IS.

The terms "insect" and "bug" are commonly applied to all minute organisms or anything that crawls; properly, an insect is a member of a certain class of lower animals, while a "bug" is a member of a certain order of insects. The term "blight" is incorrect, it being the common name of the fungus diseases of plants, themselves low parasitic forms of plant life. Insects constitute the class Hexopoda or Insecta, and the derivation of the former Greek word gives the chief distinctive characteristic of insects, that is, they possess six feet. Insects are, zoologically, closely related to spiders, scorpions and centipedes, lower forms of invertebrate animals, but further distinguished from them by having the body segments divided into three well defined parts, and supplied with certain appendages.

STRUCTURE OF INSECTS.

The body of an insect is made of a series of segments or "body rings" divided into the head, the thorax and the abdomen. The first two divisions of the body bear certain appendages characteristic of all insects, namely the antennae or "feelers" and the mouth-parts of the head, and the legs and wings of the thorax; there being always in the adult insect three pairs of legs and usually one or two pairs of wings. The segmentation of an insect is well shown in the abdomen, not so clearly indicated in the thorax, and in the head fusion has progressed to such an extent that this part of the body appears as a box-like structure. The skeleton is external, that is, the internal organs of digestion, the nervous system and the respiratory system, as well as the muscles of the body-wall, are supported and protected by a hard shell-like covering. This covering or *chitin* is so deposited in certain places

as to form a hard and resistant surface, while in other places it is flexible enough to permit a free movement of the body as a whole or the functioning of its various parts.

Increase in size, or growth, is provided for by shedding from time to time, during the young or developmental period, this outer covering. This process is called "molting" and these changes of skin mark the early stages of development in insects.

MOUTH PARTS.

The anatomy of the head is of interest, for by the structure of the mouth-parts one can determine the nature of the injury wrought by plant-feeding species. The mouth-parts of some insects of which those of the beetles and the grasshoppers offer examples, are formed for biting off or gnawing into and masticating the portions of the plant upon which the insect feeds. That is, insects with biting mouth-parts actually chew, masticate and swallow the portions of the plant upon which they feed. The jaws of this type of insects move from side to side like swinging doors, instead of up and down as is the case in higher animals.

In such insects as leaf-hoppers, scale-insects and plant-lice, the mouth-parts are formed for sucking. The food of plant-feeding species, having a mouth after this fashion, is not portions of the plant itself, but the sap or juice thereof. The portions of the plant fed upon are left intact, but the result of the myriad of small pumps sucking out the very life of the plant can be imagined.

DIGESTION.

It might be well to refer in this very general manner to the organs of digestion of insects. They consist of the alimentary canal and its appendages. The alimentary canal is a tube running the length of the body in almost a direct line. This tube is separated into definite parts and supplied with various structures. The shape and size of the parts and the presence of certain supplementary structures depends on the food of the insect, that is, whether it is a chewing insect and takes into its system portions of the plant to be digested or is a sucking insect and feeds simply upon the sap or juice. A poison placed upon the foliage of a plant is carried with the portion eaten by a chewing insect directly into the system. On the other hand, a sucking insect would not be injured by placing a poison on the surface of its food since

its beak or proboscis extends through the epidermis to the sap beneath. Therefore in the latter case we must treat the insect itself and not its food.

INSECT CHANGES.

Just as the injurious insects of the orchard or farm can be divided into two great classes as regards their food habits, that is, chewing insects and sucking insects, so also they can be divided into two great classes or divisions as regards their process of development. All insects undergo during their developmental period remarkable changes of structure, form and habits. With some, as the moths and butterflies, the beetles and the true flies, the change of form is complete. These insects after hatching from the egg have three distinct stages of development,—the young or larval period, commonly called the caterpillar, grub or maggot; the pupa, a period of transformation; and the adult winged form. The young or larval stage is one of growth and it is during this time that the plant feeding species often do their greatest injury.

With those insects not making a complete change of form during their development, the young on hatching from the egg resemble the parent, in possessing the three distinct divisions of the body, three pairs of legs and other characteristics of the adult insect, with the exception that they are smaller in size, lack wings, and are otherwise immature.

INSECT CONTROL.

Insect control may be classified as follows: Direct Measures, Cultural Methods, Sanitation, Natural Enemies, and Quarantine.

Direct measures implies going into the orchard with the necessary apparatus and compounds and actually destroying the injurious insects in numbers sufficient to reduce their injury to a minimum.

Insecticides for biting insects (stomach poisons): Insects that bite off and swallow the portions of plants upon which they feed would likewise take into their systems any poison that might be placed upon the surface. Therefore, in combating an insect belonging to this class, that is, those actually chewing or gnawing into the foliage, the idea is to cover the surface with a poison harmless to the plant but sufficient in strength to kill the insect when taken into its stomach. The insect killing substance, or

insecticide as it is called, is applied evenly over the surface in the form of a fine spray or powder by various machines made expressly for the purpose. The arsenical poisons are the common remedy for the biting insects and among the various compounds, Paris green has been the standard one. Paris green is usually applied in milk of lime. The lime in the mixture has the property of off-setting the burning qualities of the Paris green. In low grade Paris green there is a large excess of free or water soluble arsenious oxid which will have a direct injurious effect on the foliage of the plant and give it the appearance of having been burned. The Paris green to be harmless to the plant should be practically insoluble in water. The finely divided crystals are only in suspension in the spraying mixture and for this reason, constant agitation of the liquid is necessary during the process of spraying. These crystals, though insoluble in water, are soluble in the digestive juices of the intestines of the insect and thus death is brought about by an absorption of the poison. One of the more recent arsenical poisons is seemingly better suited to the Hawaiian conditions than Paris green. This compound is an arsenate of lead. Paris green, as has been said, is quite likely to burn the foliage, especially if it is of low grade or is not used with lime; it is easily washed away by showers and being not easily seen when used alone, is difficult to apply evenly over the surface of the plant. On the other hand, the arsenate of lead is entirely insoluble in water, thus obviating any danger of burning the foliage, it is white in color, thus insuring an even coating over the plant, and is quite adhesive, not being easily washed away by showers. These properties of the arsenate of lead in the freshly prepared wet form make it preferable to the less adhesive though more active Paris green. The arsenate of lead is now on the market in paste form, ready for immediate use. Such preparations are for sale in Honolulu.

Insecticides for sucking insects (gases, contact poisons and external irritants): Since those insects feeding upon the juices and sap of plants do not swallow portions of the plant itself but gain their food by inserting the beak or proboscis through the epidermal layers into the tissues, it is to be seen that they would not be affected by a poison placed on the surface. Therefore in fighting the insects belonging to this second class, other methods must be employed. The methods are to kill the pests by applying to their bodies an external irritant or contact poison, and by submitting

them to the fumes of some deadly gas or fumigation. In the case of the external irritants applied as a spray or powder, the entire body of the insect must be covered and every infested portion of the plant treated to have the work effective. The oil sprays or washes are the most important remedy for sucking insects and the standard one has been the kerosene emulsion. The resin wash is not suited to the Hawaiian conditions because of the fact that this wash acts principally as a covering to the insect and kills by smothering the pest. Resin wash has been used with success against certain scale insects in California during the rainless season. With the frequent rains here and the necessarily greater length of time for the resin wash to act in comparison to the oil washes, the more active kerosene emulsion should be used.

It is not deemed necessary to give in this connection the various mixtures for biting and sucking insects with directions for their preparation, for the reason that the whole subject is discussed in Bulletin No. 3 of this Station, Insecticides for use in Hawaii, which has had a wide circulation in the Territory and can be received free of charge by anyone requesting same. As discoveries are made in the preparation of insecticides or the machinery for applying them of value to the residents in the Territory, the information will be published in due time for distribution. Since the character of the remedy and the apparatus for applying it depends entirely on the pest to be treated, the plant it infests and the local conditions, it is hoped the Station in instances of insect attack will be informed of the particular pest and the plant infested, and will receive specimens of both, upon receipt of which the fullest possible information will be given to the correspondent, and in so far as is possible, a personal visit of inspection made.

CULTURAL METHODS.

It is a fact accepted by economic entomologists without exception, that a healthy plant can resist to a great degree the attack of an insect enemy. To bring about maximum growth and vigor, we must see that our fruit trees receive a sufficient supply of water and plant food. Also in the various cultural practices we must consider their direct effect on the insect pests; that is, to control an insect pest by cultural methods, implies more than the practice suitable for the plant itself. For example, in tillage it may be

that as far as the plant requirements are concerned, only the surface of the soil need be kept in a friable condition, but I think it well to frequently stir the soil about fruit trees to a considerable depth to break up and disturb the queen and larval chambers of the ant nests about the roots since these insects are very active in the distribution of the scale insects. For the same reason it would be well to occasionally flood the area about the trees for a period of several hours. In pruning, furthermore, the purpose of the trees may not require leaving the center open so that a free access of light and air is possible, but just this condition is unfavorable to the development of scales and mealy-bugs, and should be practiced. Also such a method of pruning makes thorough spraying possible. Enough has been said to show that cultural methods can be made an important factor in orchard insect control.

ORCHARD SANITATION.

I have seen owners spraying for the Avocado Mealy-bug and allowing wild guava to grow about the place simply covered with the same insect. Obviously the guava should have been eradicated. If Hawaii is to become a fruit producing country, it must of necessity learn the lesson of putting on the market not alone fruit, but clean fruit. All manner of places that will harbor insect pests must be done away with. Many plants of no economic importance are included in the list of food plants of many of the insect pests. What good to fight the pests on the fruit trees and leave these plants to breed new generations? Rubbish piles must be burned, and the fallen fruit and culls destroyed. After harvesting a crop, the orchard should be as clean as it is possible to make it. This preventive work pays.

NATURAL ENEMIES AND QUARANTINE.

The first three methods of insect control, namely, direct measures, cultural methods and sanitation are of the most importance to the fruit-grower himself, since they are methods actually within his power to use at a time when his trees are menaced by injurious insects. However, there yet remains to be mentioned two more methods, that is, natural enemies and quarantine. It may be that the time will come when orchard sanitation, natural enemies and quarantine will obviate the necessity of direct

measures. Certain it is that far-reaching results have been obtained through these phases of insect warfare, but the use of direct measures on the part of the fruit-grower or planter is still a necessity, and we must await further results from the last named methods before we can do away with the former. All insect pests have, naturally, many enemies, and in some localities, notably in the United States and Hawaii, many additional ones have been introduced. With these insect friends the fruit-grower should become acquainted, and not only should their propagation and dissemination be encouraged, but the specialist engaged in the work of investigating this phase of insect control should have liberal support.

Until very recent times the development of a country agriculturally, has implied that with the introduction of desirable economic plants should come also their many and various insect enemies, and that as the commercial relations of a country became intimate with other countries such injurious species would continue to be introduced. Although many of the injurious species of insects, particularly the class that includes the scale insects, mealy-bugs, etc., are almost world wide in their distribution, there are many that are peculiar to the country in which they occur. It remains then for a community alive to its own interests to take the necessary precautions that shall prevent the introduction of these pests. Hawaii can well be commended for supporting specialists to work out the problems along these lines.

As regards the pests already present in the Islands affecting fruit trees, the grower must look in the main to his own efforts for relief. If we at the Experiment Station can help you, you must let us know your problem in all its details. After four years' experience in answering personal inquiries and letters on this subject, I feel that first of all a grower must know what an insect is, before he can form an opinion of the cause of the failure for trees to grow. We get an inquiry "The blight is killing my trees, what can I do for it?" We surmise that the "blight" is a scale-insect, but naturally wonder what the blight is, what the tree is, and are justified in many instances in thinking that the trees might die in any event. That it isn't a case of dollars and cents with many of our correspondents, we are certain, in that we fail to get specimens and further details when writing in reply. It often comes out that, "Oh well, if we must do this or that, it won't pay, I only thought you could send me a remedy that would

do it." The same person would easily understand that we couldn't send him a hoe that would cultivate without any effort on his part, the trees. A better understanding is sought. We are not an agricultural college, and cannot give a course in economic entomology, but in so far as our investigations have progressed, we are ready to give those in need the entire benefit of them.

LIST OF INJURIOUS HORTICULTURAL INSECTS IN HAWAII:

CITRUS.

(Orange, lemon, lime, grape-fruit, etc.)

The Japanese Beetle, *Adoretus umbrosus* Fab. var. *tenuimaculatus* Waterh.

Fuller's Rose Beetle, *Aramigus fulleri* Horn.

The Torpedo-Bug, *Siphanta acuta* Walker.

The Orange Aphis, (undetermined).

Scale-Insects (*Coccidae*):

The Purple Scale, *Lepidosaphes beckii* Newm.

The Florida Red-Scale, *Chrysomphalus aonidum* Linn.

The California Red-Scale, *Chrysomphalus aurantii* Mask.

Mealy-Bug, *Pseudococcus filamentosus* Ckll.

Pulvinaria psidii Mask.

The Fluted Scale, *Icerya purchasi* Mask.

Several other scale insects are recorded but are not common.

AVOCADO.

The Avocado Mealy-Bug, *Pseudococcus nipae* Mask.

Fiorinia floriniac Targ. (Scale-insect).

Phenacaspis eugeniae Mask. (Scale-insect).

A Bark Beetle, *Xyleborus immaturus* Blackburn.

PINEAPPLE.

The Pineapple Scale, *Diaspis bromeliae* Kerner.

The Pineapple Mealy-Bug, *Pseudococcus* sp.

MANGO.

The Mango Weevil, *Cryptorhynchus mangiferae* Fabr.

The Torpedo-Bug, *Siphanta acuta*, Walker.

Lepidopterous larva, (undetermined).

Scale Insects (*Coccidae*) :

The Mango Scale, *Coccus mangiferae* Green.

The Florida Red-Scale, *Chrysomphalus aonidum* Linn.

Phenacaspis eugeniae Mask.

Coccus longulus Dougl.

Mealy-Bug, (undetermined).

BANANA.

The Sugar-Cane Borer, *Sphenophorus obscurus* Boisd.

A Borer, *Calandra remota* Sharp.

The Cocoanut Leaf-Roller, *Orneodes blackburni* Butler.

Phenacaspis eugeniae Mask. (Scale-insect).

Chrysomphalus aonidum Linn. (Scale-insect).

Saissetia nigra Nietner. (Scale-insect).

GRAPE.

The Avocado Mealy-Bug, *Pseudococcus nipae* Mask.

Pseudococcus filamentosus Ckll. (Mealy-bug).

The Japanese Beetle, *Adoretus umbrosus* Fabr. var. *tenuimaculatus* Waterh.

Fuller's Rose Beetle, *Aramigus fulleri* Horn.

Lepidopterous larva, (undetermined).

GUAVA.

Fuller's Rose Beetle, *Aramigus fulleri* Horn.

The Avocado Mealy-Bug, *Pseudococcus nipae* Mask.

Pulvinaria psidii Mask. (Scale-insect).

FIG.

The Avocado Mealy-Bug, *Pseudococcus nipae* Mask.

Saissetia migra Nietner. (Scale-insect).

HANA FOREST RESERVE.

At the meeting of the Board of Commissioners of Agriculture and Forestry held on October 31, 1906, the reports of the committee on forestry and of the superintendent of forestry on the proposed Hana Forest Reserve in the District of Hana, Island and County of Maui, were approved and a resolution in regard thereto adopted.

The proposed Hana Reserve embraces all the mauka portion of the Hana District. The total area is 14,825 acres. Of this 1,058 acres is fee simple land, 7,013 acres government land under lease and 6,754 acres unleased government land. The last named area can be actually set apart at once.

Following the usage of the board the resolution and reports concerning the Hana Forest Reserve are published herewith:

RESOLUTION IN REGARD TO THE PROPOSED HANA FOREST RESERVE.

Resolved, That those certain lands in the District of Hana, Island of Maui, bounded in general terms as follows:

Lying on the eastern slope of Mount Haleakala, bounded on the west and north by the Koolau District, on the east by a line following approximately the lower edge of the existing forest across the Hana District, on the south by the Kipahulu District; and containing an area of 14,825 acres, more or less, as recommended in a report of the Committee on Forestry, dated October 30, 1906, based on reports of the Superintendent of Forestry, dated March 2 and April 6, 1906, which reports are on file in the office of the Board of Agriculture and Forestry, the boundaries of which proposed reservation more particularly appear by and on maps made in March, 1906, by the Hawaiian Government Survey Department, which said maps are on file in said Survey Department and marked "Registered Maps Numbers 1268 and 1750" and "Hana Forest Reserve, Maui," and a description accompanying the same numbered C. S. F. 1690, which said description is now on file in said Survey Department, copies of which said maps and description are now on file in the office of this Board, and made a part hereof, be approved as a forest reserve to be called the "Hana Forest Reserve."

Resolved, That the Board recommends to the Governor that the government lands lying within the boundaries of the said proposed Hana Forest Reserve be set apart by him, subject to

vested rights therein, after the hearing required by law, as the "Hana Forest Reserve."

This resolution was adopted by the Board of Commissioners of Agriculture and Forestry on October 31, 1906.

REPORT OF THE COMMITTEE ON FORESTRY.

Honolulu, T. H., Oct. 30, 1906.

Board of Agriculture and Forestry,

Honolulu, T. H.

Gentlemen: Your Committee on Forestry beg to report that they have had under consideration the reports of the Superintendent of Forestry, dated March 2nd and April 4th, 1906, concerning the proposed forest reserve in the District of Hana, Island of Maui.

This proposed reserve embraces and includes the entire mauka portion of the Hana District. It contains a total area of approximately 14,825 acres. The greater part of the land included belongs to the Government, the private holdings within the reserve boundaries amounting to only about 1,058 acres. Of the government lands, about 8,100 acres are under lease; the remainder, about 6,000 acres, is open for reservation.

The object of the proposed Hana Forest Reserve is to protect the head waters of the streams on which the water supply of the Hana District depends. The Kaeleku Sugar Company, Limited, which now controls the greater part of the land within and adjacent to the reserve approves of the project and desires that the land be set apart as a reserve. Under the terms of existing leases this company is protecting the forest by keeping out cattle and taking measures to prevent fire.

Your committee recommend that the Board approve the recommendations of the Superintendent of Forestry regarding the proposed reserve and that the Board recommend to the Governor that the area be set apart by him after the usual form as the Hana Forest Reserve.

Your committee herewith submit a formal resolution carrying the foregoing recommendation into effect.

We remain,

Your obedient servants,

L. A. THURSTON,

W. M. GIFFARD,

Committee on Forestry.

REPORTS OF THE SUPERINTENDENT OF FORESTRY.

March 2, 1906

Committee on Forestry,

Board of Commissioners of Agriculture and Forests

Honolulu, Oahu.

Gentlemen: I beg to submit the following preliminary report upon the creation of a forest reserve in the District of Hana, Island of Maui, and to recommend a boundary therefor which should also serve as the forest line, above which the government land should not be again leased. This recommendation in no way affects the leasing of the water right on the upper land, including rights of way for flumes, ditches and the permission to develop additional supplies by tunneling or other methods.

The present report is based upon the results of personal studies of the local conditions made on the ground in September 1904 and February 1906. It is submitted at this time in consequence of a request from the Commissioner of Public Lands for recommendations in regard to the forest line in the District of Hana. The request was made about a year ago, following application made to the Commissioner of Public Lands for lease of certain tracts in the Hana District, particularly the crown lands of Wailua and Waiohinu. As Mr. Pratt desires to advertise these leases without further delay, I recommend that the Board now approve the line proposed herein. Later a final report containing a technical description of the proposed boundary line will be submitted to the Board, when the matter can be brought to the attention of the Governor in the regular way.

The area included in the proposed Hana Forest Reserve embraces all the mauka portion of the District of Hana, Island of Maui. It lies as a roughly rectangular block the mauka, northeast and southeast sides of which are made by a line starting from Puu Hinai on the Hana-Koolau District boundary line and following approximately the lower edge of existing forest across the Hana District to a point on the Hana-Kipahulu District boundary, at an approximate average elevation of 1,500 feet. The northwest and southwest sides of the rectangular area are respectively the Hana-Koolau and

Hana-Kipahulu boundary line, from the points named above to their intersection on the upper slope of Mt. Haleakala.

By far the greater part of the land within the proposed reserve belongs to the Government. A large share of the area, including all the mauka portion of the reserve, is under lease to the Kaeleku Sugar Company, much of it being covered by a single lease which runs until May 1, 1917. In this and in the other forest land leases held by the Kaeleku Sugar Company are clauses providing that the forest be protected from cattle and other sources of injury. Within but along the makai edge of the reserve are several government lands not now under lease that could at once be set apart.

The object of the Hana Forest Reserve is to protect the forest covering the watershed on the mountain slopes above Hana, from which comes the water that supplies the agricultural lands below. Practically all of the principal streams rising in the proposed reserve have been drawn upon in the past to furnish water for the purposes of domestic supply, fluming and irrigation. Just now several of the old flumes and water-heads are not in use, but if recently made plans for the development of the Hana District are carried out all the water that can be got from the mountain side could be put to good use.

The lower or makai line of the proposed Hana Forest Reserve is for a good part of the distance the mauka boundary of various private grants and awards. This line marks in almost all cases the upper limit of land suitable for agriculture under existing economic conditions.

The elevation of the highest lands in Hana on which sugar cane has been cultivated does not exceed 1,200 feet and at present the cane seldom reaches the 1,000-foot contour.

Between the line of possible cane land and the lower edge of the proposed forest reserve there is a section now covered with ferns, ti, lantana, and other vegetation of a like character, with some scattering trees. The only economic use to which this belt is at present put is the cultivation of upland taro in small patches by Hawaiians living on the lower land.

There is practically no demand in Hana for grazing land. The ranch department formerly run by the plantation has now been permanently given up and as the plantation controls for long terms the majority of both government and fee simple

land in the district, there is not enough other land available for an independent cattle ranch. The only cattle now raised in Hana are a small herd owned by a Portuguese butcher, and for the most part these animals are grazed on the lower lands that were formerly used as cane fields by the Hamoa plantation. Much of this section of the Hana District is now covered by a dense stand of lantana. Somewhat higher up guava and sumach are found in scattering clumps, which in coming years will doubtless serve as centers of distribution for these trees. If the lantana on the lower lands were cleared off there seems to be no reason why this section should not produce as much and as good sugar as formerly, if indeed the lands have not been improved by lying fallow.

For the reasons outlined above the area inclosed by the boundaries described below should, in my judgment, be created a forest reserve, and the government land within the same set apart by the Governor in as large an area as is now possible, while the reserve should be added to by the setting apart of the other government land as from time to time the leases on them expire and they become available.

Following is a popular description of the line which I recommend be adopted as the boundary of the Hana Forest Reserve and approved at this time as the forest line in the Hana District, above which government land should not be again leased. As stated above a technical description will be compiled later and submitted to the Board in a supplementary report.

Description of the Forest Line, District of Hana, Island of Maui.

Beginning at Puu Hinai on boundary line between the Districts of Hana and Koolau the line should run in a general southeasterly direction across the lands of Makapuu (gov't.), West Honomale (fee simple), East Honomale, Kawela and Kaeleku (all government), to a point on the shoulder of the hill called Olopawa, a few hundred feet northeast of the Government Trig Station; thence across the lands of Honokalani, Wakiu and Kawaipapa, (all government,) to a point on the pali of the Kawaipapa Gulch at the northwest corner of the fee simple land of Niumalu; thence along the boundary dividing the government land from the various grants and awards

below to the southwest corner of Oloewa (fee simple); thence across the lands of Aleamai and Haneoo (both fee simple) to the northwest corner of Mokae; thence along the mauka boundary of Mokae to its southwest corner; thence across the land of Kakio (gov't.) to a point on the northern boundary of Waiohinu (gov't., crown), where said boundary makes a marked angle; thence across Waiohonu to a point on its southern boundary somewhat further mauka where this line is marked by an angle; thence across various small fee simple lands to a point on the northeastern boundary of Muolea, where said boundary turns almost due east; thence across said Muolea (fee simple) to the northwest corner of Grant 382; thence along the mauka line of said Grant 382 to its southwest corner; thence across the land of Wailua (gov't., crown) to the northeast corner of Grant 1165; thence across the mauka boundary of Grant 1165 and the line separating the government land from other grants and awards to the Hana-Kipahulu District Boundary; thence following up said district boundary until it intersects with the Hana-Koolau District Boundary at a point on the ridge above the great Kipahulu Valley, some distance to the east of the Government Trig. Station, Wai Anapanapa; thence following down the Hana-Koolau District Boundary line to the point of beginning.

It may be noted that the line just described may be easily traced on the colored map of Maui that accompanied the report of the Governor of the Territory of Hawaii for 1901.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

April 6, 1906.

Committee on Forestry,

Board of Commissioners of Agriculture and Forestry,
Honolulu, Oahu.

Gentlemen: I beg to submit a supplementary and final report upon the proposed Hana Forest Reserve. This report contains some additional notes on the ownership and present status of the forest lands in Hana and includes the technical description of the boundary of the proposed forest reserve, prepared by Mr. F. E. Harvey of the Survey Office.

The greater part of the area included in the Hana Forest Reserve is made up by the tract known as the Hana Forest. The area of this tract as given in the last land list is 11,800 acres, of which 7,500 acres are under lease to the Kaeleku Sugar Company, Limited, until May 1, 1917. The remainder, 4,300 acres, is not now under lease.

Other forest lands within the reserve under lease to the Kaeleku Sugar Company, Limited, are the lands of Koali and Puuhaoa, Lease No. 479B, which expires December 5, 1913; a portion of Wakiu, Lease No. 518, which expires May 2, 1920; and a portion of East Honomale, Lease No. 474, which expires August 17, 1908.

The important unleased government lands, portions of which are within the reserve, are Puualu, Paehala, Wailua, Waiohonu and Kakio, as well as some remnants which cannot now be accurately described. Wailua and Waiohonu were formerly classed as "crown lands"; all the other Territorial lands in the reserve were "government lands."

Portions of the following privately owned lands are also within the reserve boundary: West Honomale, Aleamai, Haneoo and Muolea. These lands are all either owned or controlled by the Kaeleku Sugar Company, Limited. The approximate areas of the portions of them within the proposed forest reserve is given by the Survey Office as follows:

	Acres.
West Honomale	187
Aleamai	357
Haneoo	84
Muolea	430
	<hr/>
	1058

There are also some remnants of fee simple land above the forest line, but their combined area is small.

The total area of the reserve is given by the Survey Office as approximately 14,825 acres. Of this about 8,100 acres is covered by Leases Nos. 492 and 579B, about 1,058 acres is fee simple land, while the remainder, 5,667 acres, more or less, is for the most part unleased government forest land. It is this portion that it is now proposed to set apart as a section of the Hana Forest Reserve.

Recommendations.

For the reasons set forth in my report on this reserve project, dated March 2, 1906, I therefore recommend that the Board approve this report and adopt a resolution favoring the creation of the Hana Forest Reserve, and that the Board request the Governor to approve the area described as the Hana Forest Reserve and to set apart such government lands within the proposed boundary as are not under lease. As nearly as can now be compiled the list of the lands which can be set apart at this time is as follows, and includes the unleased and mauka parts of the lands of Puualu, Paehala, Wailua, Waiohonu, Kākio, Wakiu and of the Hana Forest Tract and also any other remnants of government land, not under lease, within the metes and bounds of the proposed Hana Forest Reserve.

Following is the official description of the Hana Forest Reserve boundary prepared by Mr. F. E. Harvey of the Survey Office. The original description is filed in the Survey Office as C. S. F. 1690. Approximate area, 14,825 acres.

[The technical description is here omitted as it will later be published as part of the official proclamation.]

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

ANNUAL REPORT.

Since going to press we have received a copy of the Second Report of the Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii, which covers the year ending December 31, 1905. We hope to give a review of this interesting publication in our next number. The Report has been widely circulated by mail, but should any one have failed to get it, copies may be obtained by application to the Bureau of Forestry, King Street.

*ROUTINE REPORTS OF THE DIVISION OF
FORESTRY.*

July 18, 190

Board of Commissioners of Agriculture and Forestry,
Honolulu, Oahu.

Gentlemen: I have the honor to report my return to Honolulu on July 13th after a three months' trip to the mainland which included visits to Washington, New York and Boston.

While in the East, and particularly while in Washington, I saw a number of persons regarding forest matters in Hawaii and made certain arrangements with officials of the Forest Service and other branches of the United States Department of Agriculture, and of the Smithsonian Institution, which I believe, lead to results of benefit to the Territory. I was fortunate in finding in Washington the men whom I most wished to see, especially Messrs. Pinchot, Hall and Sudworth of the Forest Service, Messrs. Galloway, Fairchild, Coville and Henshaw of the Agricultural Department and Dr. Rathbun of the Smithsonian Institution, all of whom appeared to have a real interest in Hawaiian conditions and to be ready, so far as possible, to assist in investigations leading to practical returns. I also had interviews with the Honorable J. K. Kūniahoale and Mr. G. C. McClellan, both of whom received me cordially.

On April 26th I delivered a paper entitled "Some Forest Problems in Hawaii," before the Society of American Foresters in Washington. Led by Mr. Pinchot, a full discussion followed which showed for one thing the deep and vital interest which he takes, not only in our forest questions, but in the conditions affecting the general welfare of the Territory as well.

In conversations Mr. Pinchot said he sincerely regretted that he was unable to visit Hawaii this summer but pressing work made it out of the question.

ROUTINE WORK.

During the past three months the routine work of the Division has gone on as usual as you know from the report of Mr. Haughton. The most important items have been the sta-

of the Ceara rubber sample plot experiments, the preparation of several planting plans under the offer of coöperation with private owners and the distribution of Bluefield bananas.

Many samples of seed of valuable and interesting exotic trees received during the last six months are coming on well in the Nursery, while a good stock of the seed of the important local trees is now in hand.

Since Mr. Haugh's last report on the subject, the Board room has been used for meetings of the following organizations, in all nine times:

Hawaiian Entomological Society, May 3, June 7, July 5.

Farmers' Institute, May 12th.

Honolulu Improvement Advisory Board, May 29th and June 29th.

McCully Improvement Club, June 4th, July 2nd.

LIBRARY.

Among the important accessions to the Library during the past three months, outside of entomological works, are the following:

Purchased.

Grisebach: Flora of British India.

Engle and Prantl: Pflanzenfamilien.

Schimper: Plant Geography.

Bentham: Flora Hongkongiensis.

Simond: Tropical Agriculture.

Von Mueller: Report on Forest Reserves.

Roxburgh: Flora Indica.

Naturalist's Universal Directory.

Nichols: Tropical Agriculture.

De Vries: Species and Varieties.

Sorauer: Physiology of Plants.

De Candolle: Origin of Cultivated Plants.

Baker: Flora Maritima and Seychelles.

Oliver: Flora Tropical Africa.

Harvey and Sonder: Flora Capensis.

Nisbet's Forestry.

Lounsbury: Flowers and Trees.

Clement: Ecology.

Romero: Coffee.

Warning: Handbook of Systematic Botany.

Ganong: The Teaching Botanist.

Wards: Trees.

Rundle: Classes of Flowering Plants.

Jackson: Glossary of Botanic Terms.

Brown: Practical Arboriculture.

Otherwise Received.

Beach: The Apples of New York.

U. S. Geological Survey: Forest Reserve Reports 1897-1898,
1898-1899, 1899-1900.

New York State: Fisheries, Game and Forest Commission,
3rd Annual Report (1897).

U. S. Census: Supplementary Analysis, Twelfth Census.

Index Agriculture of Massachusetts 1837-1892.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

August 29th, 1906.

Board of Commissioners of Agriculture and Forestry,
Honolulu, Oahu.

Gentlemen: I have the honor to submit the regular report of the Division of Forestry for the period from July 18th to date.

TRIPS TO KAUAI AND HAWAII.

My own time during this period has been occupied with the two trips to Kauai and Hawaii, respectively, and with duties in connection with proposed forest reserves and routine work of the Division.

On July 23rd Mr. C. S. Judd was appointed Special Forest Agent in the Division of Forestry, and on the 24th I went over with him to Lihue, Kauai, to start the work of making measurements in the planted forest of the Lihue Plantation.

which he is to carry on this summer. Returning to Honolulu on July 29th, I was in Honolulu for a week. Then on August 7th, I visited the Districts of South Kohala and Hamakua, on Hawaii, looking into forest problems on the Kohala Mountain, on the land of Kaohe, and in the section above the Hamakua Sugar Plantation. Many of these examinations were made in company with Mr. J. W. Pratt, Land Commissioner, and Mr. A. W. Carter, representing the interests of the Parker Ranch. I returned to Honolulu on August 18th.

FOREST PLANTING PLANS.

I am very glad to note the fact that a number of applications have recently been received for planting plans under the offer of coöperation contained in Circular No. 1 of this Division. From August 14th to 25th Mr. Haughs was on the Island of Maui, in response to requests from the Wailuku Sugar Company, Dr. J. H. Raymond and Mr. W. J. Coelho of the Wailuku Improvement Association. For the details of this trip Mr. Haugh's own report should be consulted.

On Oahu similar applications have been received from the Waianae Plantation Company, and from Mr. H. M. von Holt, representing the Oahu Railway and Land Company, while a meeting of gentlemen representing the plantation interests in the Ewa Basin has been called to discuss planting projects in that district.

COLLECTION OF SEED.

Mr. Haugh's report shows that considerable quantities of seed have been collected within the last few weeks. The Division is also in receipt of several shipments of foreign seed, notably several packages of pine seed from the United States Forest Service. These seed will be distributed to gentlemen who are coöperating with the Division in experimental planting.

RUBBER EXPERIMENTS.

A considerable quantity of Ceara rubber seed has been sent out to various persons throughout the Territory who have agreed to plant the seed and occasionally report upon it to this Division. Recently the offer to distribute sample lots of Ceara

seed has been made to the general public, so that many more packages will probably be sent out within the next week or two.

CEARA RUBBER GROVE ON KAUAI.

In this connection mention may be made of a grove of 104 living Ceara trees, about 6 years old, which Mr. Judd has found in the planted forest of the Lihue Plantation on Kauai. Provisional arrangements have been made with the Lihue Plantation Company, looking toward experiments in systematic tapping of these trees. The details of this matter will be reported upon later. For further details in regard to this grove reference should be made to the very comprehensive report prepared by Mr. Judd, under the date of August 24th.

FOREST FIRES.

I have to report two brush fires in Nuuanu Valley, respectively on July 24th and August 16th. The first fire was on the slope below Pacific Heights; the other on the ridge above the property of the Country Club. For further details in regard to these fires reports by Mr. Haughs and by myself should be consulted.

MEETINGS.

The Library room in the Board building was used on August 2nd for the 19th regular meeting of the Hawaiian Entomological Society, on August 13th by the Pawaa Improvement Club, and on the 6th, 14th and 24th by the Hawaiian Poultry Association. At the meeting of the 6th, an address on the "Raising of Fowls" was given by Mr. B. M. Stone of Fresno, California. The meeting of the 14th was the regular monthly meeting of the Society, and that of August 24th was an executive committee meeting. In return for the privilege of using this room, the Poultry Association is to subscribe to a number of Poultry Journals which will be turned over to the Library of this Board, where they may be consulted by any one interested.

DISTRIBUTION OF YEAR-BOOKS.

During the past few weeks the quota of the Year-book of the Department of Agriculture for 1905 received from the Delegate

to Congress has been distributed from this office to persons in one way or another connected with the Board and to those applying under an offer in the newspapers. On the opening of the schools in September each principal will be furnished with one copy of the year-book. A few still remain for general distribution.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

October 3, 1906.

Board of Agriculture and Forestry,
Honolulu.

Gentlemen: I have the honor to submit the regular report of the Division of Forestry for the period from August 29th to date.

TRIP TO KAUAI.

My own time during a considerable portion of this period has been occupied with a trip to the Island of Kauai. Leaving Honolulu on September 4th, I spent three days at Lihue, going over with Mr. C. S. Judd, the figures which he had been collecting during the preceding month, and discussing with him plans for the completion of the field work and the preparation of the report resulting from his investigation. During this time I also visited the two Ceara rubber groves in the planted forest at Lihue and in the Kaluahonu Gulch at Koloa, and made further arrangements with the Lihue and Koloa Plantation Companies, looking toward the experiments in systematic tapping of these trees, which are soon to be undertaken under the auspices of this Board and the Hawaii Experiment Station.

From September 8th to 20th I was engaged in making an examination of the mauka portion of the Kona and Waimea Districts of Kauai, visiting in turn Mr. Walter D. McBryde, Mr. Francis Gay and Messrs. Augustus and Eric Knudsen. Thanks to the courtesy of Messrs. Gay and the Knudsens I was able to see much of the upper portion of Waimea. As a result of this examination I shall, in the near future, submit a

report recommending a forest reserve boundary, extending from the present private reserve of the Lihue Plantation Company at Kilohana Crater back of Lihue around to and including the Napali District. On Thursday, September 20th, in company with Mr. S. Weinzheimer, I went over the proposed forest reserve boundary on the mauka portion of that plantation, as I had earlier in the month visited with the Rev. J. M. Lydgate, the proposed forest line across Mr. G. N. Wilcox's land of Haiku.

From September 21st to 24th inclusive, I was engaged with a trip to Hanalei in company with Messrs. W. E. Rowell and Fred E. Harvey of the Survey Office. The object of this trip was to examine certain land within the boundaries of the Halelea forest reserve on which Mr. Rowell had expressed a desire to grow rubber. This matter will form a subject of a report to the Committee on Forestry in the near future. On September 25th I returned to Honolulu where I have since been engaged with the preparation of reports and attention to routine matters of the Division of Forestry.

REPORTS OF THE FOREST NURSERYMAN.

Special attention is called to Mr. Haugh's reports under the dates of September 4th and October 2nd, in which are noted various points of interest that have occurred during September in connection with his section of this Division. During this period planting plans have been prepared by him for the Wailuku Plantation, for Dr. J. H. Raymond, and for the Waianae Plantation. Mr. Haugh's reports contain an interesting note in regard to the work done by the Wailuku Improvement Association, in which the Hon. W. J. Coelho has taken a very active part.

TRIP OF THE FOREST NURSERYMAN TO HAWAII.

In response to requests for planting plans Mr. Haugh's left yesterday for a ten days' trip to Hawaii to visit the Kukaiau and Pahala Plantations, and to inspect some other planting work started earlier in the season under the supervision of the Division of Forestry.

ROUTINE WORK.

During September the routine work of the Division has gone on as usual. In connection with the seed collection it may be noted that a number of packages of seed of native Hawaiian plants have been prepared and sent to botanical gardens and other institutions in various parts of the world. By such an exchange we expect to receive in due course important additions to our own collections.

LIBRARY.

Owing to the fact that several pamphlets have been removed from the Library by unknown persons it has become necessary to adopt somewhat stricter rules governing the reading room. Each visitor is now obliged to register upon entering the Library, while careful track is kept by one of the members of the staff of the several publications which he consults. I regret that even this action has become necessary for I desire that the Library shall be freely used by all those interested in the general subject of agriculture.

MEETINGS.

The Board room was used during September for the following meetings:

Hawaiian Entomological Society, September 6th.

Hawaiian Poultry Association, September 11th, 19th and 26th.

The Waialae, Kaimuki and Palolo Improvement Club (annual meeting), September 28th.

Honolulu Improvement Advisory Board, also on September 28th.

Farmers' Institute, September 29th.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

October 31, 1906.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen: I have the honor to submit the routine report of the Division of Forestry for the period from October 3rd to date.

During the first portion of this period I was in Honolulu, engaged with the preparation of reports upon the land of Kaohe, Hawaii, and a modification of the Halelea (Kauai) Forest Reserve boundary, and routine matters of the Division. The two reports were submitted to the Committee on Forestry on October 15th.

On October 16th, in response to a request from the Hawaiian Mahogany Lumber Company, Limited, I went over to Hilo on the Kinau and spent the next week with Mr. E. H. Cant, the manager of the company, going over with him in detail, on the ground, his plans for logging the mature Koa on the Bishop Estate land of Keauhou, Hawaii. I returned by the Mauna Loa, arriving in Honolulu on the 26th.

Mr. Haugh's time during the greater part of October has been occupied in supervising the shipment of plants, sent to various schools throughout the Territory for use on Arbor Day, November 2nd, and in preparing planting plans and reports upon the tracts in Hamakua and Kau examined by him during his recent trip to Hawaii.

ROUTINE WORK.

On October 11th, Miss Marie Legros was appointed for a temporary period as assistant clerk to undertake certain routine office work under the Board, consisting of the re-arrangement of the mailing list, the classification of the card catalogue of United States Experiment Station publications and certain other work in connection with the Library.

The second annual report of the Board for the calendar year 1905 appeared on Saturday, October 13th, when a few advance copies were received from the printer. This report will be generally distributed within the next few days when mailing envelopes are received.

FOREST FIRES.

As a result of the action taken by the Board at a meeting held on October 3rd, I have been informed by the secretary of the Country Club that the expenses of the men ordered out for fire fighting on the Country Club property will be borne by that organization.

MEETINGS.

During the month the Library room of the Board has been used by the following organizations:

Hawaiian Entomological Society, Oct. 4th.

Hawaiian Poultry Association, Oct. 3rd and 9th.

Honolulu Improvement Advisory Board, Oct. 15th.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

*THE POLICY OF THE BOARD IN REGARD TO
LUMBERING.*

The interest now being taken in the koa lumber industry on the Island of Hawaii, where two companies have begun work in the woods, makes important the attitude of the Board of Agriculture and Forestry in regard to this phase of the forest question. In the following reports read and approved at the meeting of the Board held on October 3, 1906, may be found an expression of the Board's policy in the matter, with an outline of the restrictions to be observed in logging and any work with which the

REPORT OF THE BOARD OF AGRICULTURE AND FORESTRY.

REPORT OF THE BOARD OF AGRICULTURE AND FORESTRY, OCT. 3, 1906.

... the report of the
... given date here-

with, relative to the request of the Hawaiian Mahogany Lumber Company, Limited, to report on the proposition to lumber certain portions of the districts of Kona and Hilo, and hereby report that they approve of the recommendations of the Forester in said report contained and recommend that a copy of the said report be furnished to the said Hawaiian Mahogany Lumber Company, Limited, as a reply of this Board to their communication dated August 6th last.

Respectfully submitted,

L. A. THURSTON,
W. M. GIFFARD. L.
Committee on Forestry.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Oct. 3, 1906.

Committee on Forestry,
Board of Agriculture and Forestry,
Honolulu.

Gentlemen:

At the meeting of the Board held on August 8th, the following letter was referred to me for consideration and report:

Honolulu, August 6th, 1906.

Bureau of Agriculture and Forestry,
Honolulu.

Gentlemen:

We are desirous of obtaining an expert opinion as to what koa in the Kona and Hilo districts, embodying land belonging to the following parties: John Maguire, Mrs. E. Greenwell, Buchholtz Estate (controlled by H. Hackfeld & Co.), John D. Paris, Colonel Norris, Mrs. Richardson, Dr. Hutchinson, and the Wilsons, together with Government land, could be lumbered without danger of injury to the forests or the water supply in that district. As Mr. Hosmer is the only authority on forestry in this Territory, we desire, if possible, to obtain his services in this matter.

We understand that he has work ahead which will occupy his time for about six weeks. We desire, if possible, that he be authorized by your Board to undertake the above work for us at the end of that period, or as soon thereafter as possible.

Thanking you in advance for an early reply, we remain,

Very truly yours,

HAWAIIAN MAHOGANY LUMBER CO., LTD.

R. W. Shingle,
Secretary.

The object of the company in making the above request is that they may use the report as an aid in securing options on the koa on the lands in question against the time when it is found possible to undertake systematic lumbering.

To furnish adequately the information requested entails a careful examination of each of the tracts enumerated, a matter necessitating field work extending over a number of weeks. In discussing with the Committee on Forestry a few days since the advisability of making such an examination it appeared that in view of the present status of the koa industry in the Territory, a general statement might for the present be sufficient, leaving until nearer the time of actual work the detailed examination of each of the several tracts. I have accordingly prepared this report, which I submit with the recommendation that a copy be transmitted to the Hawaiian Mahogany Lumber Company, Limited.

The general policy of the Board, as well as my own attitude in the matter, is in favor of lumbering the mature trees of merchantable value in the Hawaiian forests, wherever such work can be done without detriment to the continued well being of the forest as a whole. In certain districts where the primary value of the forest is from its serving as a protection cover on important watersheds it will probably be found advisable to maintain the forest intact.

But in districts where, except in restricted localities, the question of stream protection is a minor consideration, as is the case in the greater part of Kona and much of Kau, there is in my

judgment no good reason why the forest, while being nently maintained, should not be so managed as to serve a tinued source of timber and other forest products. This is the essential object of forestry—the perpetuation of th through wise use.

From my acquaintance with Kona and Kau I believe cause of its general relation to the various industries i districts and to some extent on account of the influenc the forest may exert on the local climate it is to the ac of the Territory that most of the area in these distric covered by the koa belt be kept permanently in forest. reason I recommend that when lumbering is undertaken on government or private lands, the work be done in acc with the methods of practical forestry.

By the adoption and carrying out of a few simple r future welfare of the forest will be assured and these ca into effect without working any appreciable hardship on tractor. The regulations which it may be advisable t may differ slightly for various tracts and can only be st actly after a detailed examination of the given area b made on the ground. As has been stated above such e tions can be made later when the time for actual work i at hand.

In general the regulations to be recommended will fo outline given below. Unless such regulations are mad of the contract I cannot recommend that lumbering be un in Kona or Kau.

The main points to be observed in drawing up a lu contract are:

(1) *The protection of the forest from fire during and ately after the logging operations.* The importance of thi is so self evident that it hardly needs to be emphasized. tractor should be required to exercise all reasonable car use of fire, and should a forest fire start on the tract f cause during the term of his contract he should be obliger out his men to fight it.

(2) *The protection of the area from cattle after lu to secure reproduction.* The central idea of forest man being the perpetuation of the forest it is essential that

taken to secure the replacement of the trees removed by logging. In most cases a new stand of koa can be secured through natural reproduction. The opening up of the forest that forms a necessary part of the logging of the mature trees insures in most cases excellent conditions for koa reproduction. But as cattle are particularly fond of the young koa it is essential that they be excluded from the tract after lumbering, at any rate, until the trees grow large enough to protect themselves. As the benefits arising from this provision revert wholly to the owner of the land it seems to me that if the contractor is required to build the fence he should receive a consideration for the work. But that the fence be built I regard as an essential feature of the forest regulations.

(3) *A restriction as to the size of the trees cut.* The idea of utilization under forestry methods is to take out the mature trees only, leaving the younger ones to make up subsequent crops. On the Keauhou tract the minimum diameter at which koa trees should be cut, was fixed at 24 inches, diameter breast high (4½ feet above the ground). Possibly in Kona a smaller minimum diameter, say down to 18 inches, might be used. This cannot be fixed off hand, but as the present condition of the koa industry hardly justifies the logging at a profit of the smaller trees there should be little trouble in arriving at a diameter limit mutually satisfactory to the contractor and to the forester.

(4) *Prevention of Waste.* So far as possible all merchantable material should be removed from the forest and turned to account. This includes as complete utilization of the felled tree as may be and the application of approved methods and machinery to the various branches of the work. Just how closely the work can be done depends on the local conditions that govern the cost of logging, but the contractor should be required to do his work in a systematic and careful way. As it is as much to his advantage as to that of the owner of the land to do so there should be no trouble on this score.

(5) *Protection of small trees during lumbering and removal of tops.* The exercise of reasonable care should be required in the logging that small trees, fern and other undergrowth, be not necessarily damaged and that other avoidable injury to the forest

be prevented. The question of the removal of the tops depends largely upon how much of the tree can be got out and sold. Where a large top must be left in the woods it is advisable, in order to lessen the danger from fire and to get rid of the slash obstructing the young growth, that it be so cut that all the main limbs be brought in contact with the ground. Just how far it is feasible to enforce such a regulation, without working hardship on the contractor can only be told after an examination of each tract.

With regard to the Hilo District my feeling is that except for the koa on the Kaumana and Ponahawai lots back of Hilo town—which I see no objection to lumbering under an arrangement generally similar to that recommended for Kona—lumbering operations should not be undertaken until a careful study of the district with this special object in view, has been made. There are doubtless certain places which could be logged under proper restrictions without detriment to the general welfare of the district, but in other situations, such for instance as the portion of Piipihonua, from which comes the water supply of Hilo town, the forest should only be opened up, if at all, after a careful study has been made on the ground.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

PRESS BULLETIN ON FOREST PLANTING.

The Division of Forestry of the Board of Agriculture and Forestry has recently issued as Press Bulletin No. 4, a four page leaflet by Mr. David Haughs, Forest Nurseryman, entitled "Instructions for Propagating and Planting Forest Trees."

The text is as follows:

INTRODUCTION.

This press bulletin has been prepared to answer inquiries that are continually being made to the Division of Forestry regarding the best methods to use in tree planting in this Territory. The directions here given are the result of many years experience on the several islands of the group and will, it is believed, meet most of the more common difficulties.

Those desiring further information on any of the points here mentioned, or on other matters having to do with tree planting should not hesitate to call upon the Division of Forestry. It is one of the functions of this office to give advice and assistance to all residents of the Territory desiring this kind of information. Letters of inquiry should be addressed to Mr. David Haughs, Forest Nurseryman, Box 331, Honolulu, Oahu.

*PROPAGATION.**Seed Boxes.*

Shallow boxes from 3 to 4 inches deep and from 12 to 14 inches by 18 to 20 inches are the sizes generally used.

Empty boxes can usually be bought cheaply from grocery or liquor stores and cut into the sizes required.

Drainage.

Five or six $\frac{3}{4}$ -inch holes should be bored in each box for drainage.

Kind of Soil to Use.

Good light soil well mixed with a liberal allowance of sharp sand and put through a fine sieve is the best to use for seed raising. Some experience however is essential to the best results in preparing it. It should be of such character that when a damp portion is firmly compressed in the hand it will fall apart when released. It should never bake. Good old garden loam

to which an equal quantity of sand has been added is usually a good soil for propagating seed. The soil should be sifted and thoroughly fined before the seeds are put into it, especially when small seeds are to be sown. The sieve used should be as fine as mosquito netting.

Filling the Boxes.

The boxes should be filled to within half an inch of the top, and the soil smoothed over with a small piece of board.

Sowing the Seed.

The seed should be sown evenly over the surface and pressed lightly with a smooth piece of wood to imbed it in the soil.

Proper Depth for Sowing.

The proper depth for sowing varies according to the size of the seed. Seed such as the different species of Eucalyptus, Casuarina, etc., should be sown upon the surface and then covered with a very thin layer of finely sifted soil or sand. If free loam cannot be obtained use fine sand mixed with about one-fourth soil.

From one-sixteenth to one-eighth of an inch of covering for seed such as the ones mentioned will give the best results. A very good rule to go by in regard to seed sowing is to make the thickness of the covering equal as nearly as possible the diameter of the seed.

Attention to the Soil after Sowing.

After sowing, the soil should be kept moist but not too wet. If too much water is used damping off is very apt to set in and this fungus disease often proves very disastrous to such seedlings as the different species of Eucalyptus, Casuarina, Grevillea, Acacia, etc. A fine sprinkler should be used when watering.

Transplanting.

When the plants have grown to from 2 to 3 inches high they should be transplanted into other boxes and the plants set in lines from 2 to 3 inches apart according to the species, some requiring more room than others. Thus the different species of the Ironwoods (*Casuarina*) and most of the Eucalypts should be planted about two inches apart, while the Black Wattle (*Acacia decurrens*), the Silver Wattle (*Acacia dealbata*) as well

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surrounding ground, so that the water may run off and not remain stagnant around the tree.

Planting.

In planting out great care should be taken to prevent the tender roots from being exposed to the air. As much soil as possible ought to remain intact around the plant.

A very general mistake in tree planting is to plant too deep. It must be remembered that the best soil is generally on or near the surface, and the tender roots of the young plant will take more kindly to it than to the often sour and poor subsoil to be found a little deeper. When digging the hole the best soil should be put at one side and used around the roots of the tree when planting.

After planting, hoeing and cleaning away the grass and weeds is necessary until the young trees get well above the grass or brush.

Forest trees like everything else will make a faster growth if kept clean.

APPROVED:

RALPH S. HOSMER,

Superintendent of Forestry.

Honolulu, Hawaii, Nov. 6, 1906.

FARMERS' BULLETINS.

The following Farmers' Bulletins have recently been published. They may be obtained free by application to the Secretary of Agriculture, Washington, D. C.:

Seed of Red Clover and Its Impurities. By Edgar Brown, Botanist in Charge of Seed Laboratory, and F. H. Hillman, Assistant Botanist, Seed Laboratory, Bureau of Plant Industry. Pp. 24, figs 39. (Farmers' Bulletin No. 260.)

Description of the Red Clover plant and seed, with illustrations and descriptions of the weed seeds with which it is usually adulterated. The purpose of this Bulletin is to emphasize the importance of the use of good seed, and is designed to supersede Farmers' Bulletin No. 123, on the same subject.

Practical Information for Beginners in Irrigation. By S. Fortier, Irrigation Engineer. Pp. 40, figs. 25. (Farmers' Bulletin No. 263.)

This Bulletin discusses the preparation of land for irrigation, the construction and location of farm ditches, methods of irrigation for several crops, and the management and economy of the water supply.

The Brown-tail Moth and How to Control It. By L. Howard, Entomologist. Pp. 24, figs. 10. (Farmers' Bulletin No. 264.)

Description, life history, and habits of the Brown-tail moth (*Euproctis chrysorrhæa*), with suggestions for its control. The Bulletin also contains a summary of the Massachusetts law for the suppression of the gipsy and brown-tail moths.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery seed and seedlings of the important native and introduced trees. These are at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, some species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, doria, etc. The price of the seed varies from 10 to 50 cents per ounce. The charge may be had for 2 1/2 cents each, except a few kinds which are 5 cents. of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.00. All seed is tested before being sent out, which insures its being good. communications in regard to seed or trees should be addressed to David Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

- Report of the Commissioner of Agriculture and Forestry for 1900; 66 pp.
Report of the Commissioner of Agriculture and Forestry for 1902; 38 pp.
* First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.
Second Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1905; 240 pp.; 8 plates; 10 text figures.
"Notice to Importers," by H. E. Cooper; 4 pp.; 1903.
"Digest of the Statutes Relating to Importation, Soils, Plants, Fruits, Vegetables, etc., into the Territory of Hawaii." General Circular No. 1; 6 pp.
"Important Notice to Ship Owners, Fruit Importers and Others. Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii." General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

- "The Leaf-Hopper of the Sugar-Cane," by R. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.
* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by R. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.
"A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1903.
"The Japanese Beetle Pungus," by Jacob Kotinsky and B. M. Newell. Circular No. 2; 4 pp.; cut; 1906.
Report of the Division of Entomology, for the year ending December 31, 1905. Reprint from Second Report of the Board; 68 pp.; 3 plates; 19 text figures.

DIVISION OF FORESTRY.

- * "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.
"Suggestions in regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.
"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 8 pp.; 1905.
"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1906.
"Instructions for Propagation and Planting Forest Trees." Press Bulletin No. 4; 4 pp.; 1906.
Report of the Division of Forestry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 77 pp.; 5 plates.

DIVISION OF ANIMAL INDUSTRY.

- "Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.
"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.
"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1906.
Report of the Division of Animal Industry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 82 pp.

DIVISION OF AGRICULTURE.

- Report of the Division of Agriculture, for the year ending December 31, 1905. Reprint from Second Report of the Board; 12 pp.

* Out of Print.

Any one or all of the publications listed above (except those marked *) will be sent to residents of this Territory, free, upon application to Mailing Clerk, U. S. Box 371, Honolulu.

Vol. III.

DECEMBER, 1906.

No. 12.

Price, 10c. Per Copy ; Per Annum, \$1.00; Foreign, \$1.25.

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THE HAWAIIAN FORESTER AGRICULTURIST

VOL. III.

DECEMBER, 1906

No. 12

The sisal fiber produced by the local plantation continues to be of excellent quality and to compare favorably with that grown elsewhere. The Portland Cordage Company recently was the consignee of a ton of Hawaiian sisal to manufacture into rope. Hitherto almost the entire output of sisal from the islands has been received by the Tubbs Cordage Company of San Francisco. An exhibit of Hawaiian fiber at the recent Minneapolis State Fair was very favorably commented upon by the local judges.

It is to be hoped that the experiment by Mr. H. Roberts in sun-dried mangoes will lead to sufficient interest in the subject to induce other growers to make a similar attempt. The dried fruit, as shown at the last Farmers' Institute meeting, met with very general favor, and many well known fruit growers present expressed their opinion that the product could be marketed on the coast. During next mango season, the best method of curing the fruit should be determined, and owners of mango trees could not do better than write in the meantime to mainland agents to arrange an experimental shipment. In this case, as it is always in initial ventures, it is imperative that our first consignments should also be the best of which we are capable in order to attract favorable criticism, and due attention should be paid to such qualities as cleanliness and appearance. With our prolific mango crop and the ready help to be obtained from the youths of Honolulu, there is no reason why the sun drying of mangoes should not be profitable.

The introduction of harvesting machinery into the Hawaiian rice fields, if at all commensurate with the benefit derived from former similar experiments in other countries, is one which is probable in time to entirely change the aspect of the conditions of this industry and to remove it from an old historic and picturesque survival into the position of being able to take advantage of the latest achievement of modern science.

Another event which is likely to be attended with far greater and wider results is the experiment lately conducted to harvest the unwieldy cane with modern machinery. Should this attempt be as successful as it appears to have been, it will materially assist to ameliorate the most pressing demands of the labor problem of Hawaii and will tend to the reduction of the production cost of sugar, which will be beneficial to cane-sugar countries in their competition with beet growers. It is estimated that the cane harvester achieves the work of sixteen men, while the rice machine takes the place of nearly twice as many more. If this allowance is not too liberal the harvesting of the rice and sugar crops by machinery will wholly alter the economical aspect of this branch of two of our chief industries.

Much attention is now being directed in Honolulu to the recently introduced "fruit" called the rosella or roselle. Strictly speaking this is not a fruit at all, but consists of the fleshy calyx of a cultivated hibiscus. The calyx in this instance ripens and becomes red and juicy, and possesses all the characteristics of an ordinary fruit. The chief use of the roselle is for making jams and jellies, and for this purpose it somewhat resembles, and by some is considered superior to cranberry. In preparing the roselle for cooking the scarlet calyxes only are used, the central seed pods being rejected. During the past years the Experiment Station has distributed much roselle seed and the plants therefrom have very generally been successfully raised. The cultivation of the roselle is simple and its introduction here will afford a supply of "soft fruit" of a kind which Hawaii has hitherto been deficient. The instance of the calyx of a flower developing the attributes of a fruit, at the expense of the true seed vessel is unusual, but is no more extraordinary than that found in the cashew nut. In this instance the stalk of the fruit thickens and is eaten, while the fruit itself possesses no food value. The Forester has just received an illustrated article on the cultivation of this interesting fruit, which will appear in January. It is written by Mr. Higgins of the Hawaii Experiment Station.

The use of charcoal in vegetable growth has been investigated in the Botanical Gardens at Washington. The chief value of charcoal lies in the fact that by gradual decomposition

it yields carbonic gas and thus directly furnishes one of the most important elements of plant food. It is found that in pot plants a mixture of two-thirds fir or pine charcoal and one-third of vegetable mold has a marked stimulus on growth, and results in healthy stems and foliage and a greater profusion of blossoms. Plants in pots containing much charcoal require more regular watering than others, as the charcoal allows the water to percolate freely, and admits air, which drives the soil rapidly. The use of a little charcoal in water has a wonderful effect in preserving the life of cut flowers. In this instance the benefit of the charcoal is probably chiefly due to its preservative effect and its capability of allowing the water to remain clear and odorless.

The success of the Wahiawa pineapple growers is now assured, and once more it is determined that Hawaiian products rank second to none in the open market. It is invidious, however, to assume that the Wahiawa fruit is the best in the islands. Equally fine pines are grown on the other islands, those from Haiku and Kona being probably the best known. In fact when such a high standard of excellence is attained as has been achieved with Hawaiian pineapples, such differences of flavor, aroma, color and texture are due largely to individual taste and to particular varietal qualities, rather than to the inherent merits of special localities.

The straw hat industry in Curaçoa is proving remunerative under the assistance of the local government and the Society for the Promotion of Agriculture. Skilful hat weavers have been engaged to instruct the people in the manufacture of fine hats. The sale of hats is effected through the society mentioned above, and the prices obtained in the American and European market have ranged from about one to two dollars each. The hats are made from an imported straw and somewhat resemble "panamas." The export of hats from Curaçoa in 1904 amounted to 46,593 dozen of a total value of over sixty thousand dollars. The hat industry is one that would well repay the investment of capital in Hawaii. With our many beautiful local materials, and the deft fingers of the natives who are proverbially good hat weavers, there is no reason why Hawaiian made hats should not find a ready sale on the coast

and be instrumental in inculcating habits of business and frugality among a class of people whose position is gradually becoming one of more and more dependence on the community.

The activity in opening up new land for home building in Manoa Valley is instrumental in attracting attention to the desirability of building another outlet from the valley in the direction of Moiliili. Kalihi valley has lately been made somewhat more accessible by additional road construction, and a loop roadway is well on toward completion in Pawaa. The opening of these roads will do much to add to the attractive drives around Honolulu and will assist in distributing the heavy loads of bananas and taro from the valleys, which at present are confined to only one or two outlets.

Enquiries have recently been received from the mainland for the shipment of Hawaiian peanuts. The cultivation of the peanut is simple, and possibly worth attention, although in view of the large area already in cultivation in other countries, there appear to be many crops equally suitable to the islands and of a more promising nature, which merit first attention.

We publish this month, in response to a request of the Superintendent of Forestry, a somewhat lengthy and technical document relative to the recent important land transactions on Maui. Although not interesting to the general reader, it is important as a matter of record and as affording an index to future similar cooperative transactions.

In a recent letter in the Pacific Advertiser Mr. W. Hannestad advocates large appropriations for forest planting and urges that all moneys spent on forestry are amply repaid in the future benefits which accrue. Mr. Hannestad is now stationed at Kailili, Maui, and was formerly engaged in forestry in Norway for eleven years.

The McBryde Sugar Plantation is reported to be encouraging the growing of pineapples on Kauai and to be contemplating

ing the establishment of a pineapple cannery there. It is thought that the new industry will help to make the condition of local labor market more constant.

This number of our paper completes Volume III, and we take the opportunity to thank those of our contributors who have assisted us so generously throughout the year. Mr. Ralph Hosmer has again placed the Forester under an obligation, by his continued interest in its welfare, throughout the year. The officers of the Hawaii Experiment Station, the Bureau of Forestry, the Hawaiian Sugar Planters' Association, together with many writers in the islands and on the mainland, have also done much to render the publication of practical utility. Mr. Jacob Kotinsky has for the latter part of the year contributed a regular series of valuable entomological papers and together Mr. Alexander Craw kept our readers informed of the interesting work of his department.

Owing to the inclusion in this number of a quantity of official matter the account of the recent Poultry and Agricultural Exhibit will not appear until next month.

A title page, index and table of contents to Volume III will be issued with the January number.

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

Second Annual Report.

The second annual report of the Board of Agriculture and Forestry has recently been published, and furnishes in an interesting and comprehensive manner an account of the work of the Board during the year 1905. The publication commences with a record of the new legislation enacted relating to forestry matters and also with the regulations adopted by the Board to facilitate the administration of its work.

During the year eight different publications have been issued by the Board, three by the Division of Forestry, two by

the Division of Entomology and three by the Division of Animal Industry.

The Division of Forestry has remained, during the period treated, under the supervision of Mr. Ralph S. Hosmer, as superintendent, with the coöperation of Mr. David Haughs as assistant and nurseryman. The district foresters have, with few exceptions, remained the same as those of former years. During the year three important forest reserves have been established, aggregating 190,469 acres. Much work has also been accomplished in preparing to create other reservations, which will be set apart at an early date. Next to the establishment of forest reserve the reforestation of already denuded areas is a matter of the utmost necessity, but the lack of funds has precluded any attention being devoted to this subject. It is satisfactory to know, however, that under the supervision and advice of the division many individuals and corporations are doing good work in forest planting. The erroneous opinion prevails with many that a forest reserve means the locking up from economic use of a certain forest area. This is a mistake. Conservation of water is one of the principle objects in view. With this is often associated the careful removal of old lumber which allows the growth of young trees and enhances the value of the forest, provided cattle is excluded. The action of the Bishop Estate in asking advice of the Board respecting the proposed lumbering of koa on Hawaii, and the suggestion given by the Board as to the best methods of proceeding with this work in order to safeguard the potential future output of koa lumber, is eloquent testimony that a beneficent forest policy is one looking to the best productive capacity of a reserve.

The Board has assisted materially in the way of individual enterprise by its wise policy of gathering the seeds of beneficial trees and distributing them at cost. The rapidly developing interest in the production of rubber has also received recognition and imported Castilloa trees have been set out in Moanalua valley, where they are doing well. From these, seeds will as soon as available be distributed. The importance of fresh rubber seeds is apparent when of 4,000 imported from Mexico by Mr. George R. Ewart only one or two have germinated.

The Division of Entomology also retains its former per-

sonel, Mr. Alexander Craw being superintendent and inspector; Mr. A. Koebele, consulting entomologist; Mr. J. Kotinsky, assistant entomologist, and Mr. C. J. Austin, inspector's assistant. The quarantine regulations against the introduction of dangerous insect pests have been efficiently enforced during the year. It is desirable, however, that a vegetable pathologist be appointed to undertake the exclusion of fungus diseases, many of which have already found their way to the islands. The attention of the inspectors has been largely occupied in enforcing quarantine regulations against fruit from countries infested with fruit flies, the harmful attacks of which have, as is well known, practically rendered the production of musk melons impossible in Hawaii. Insect pests are not the only object of the inspector's solicitude, as is evidenced by a collection of fourteen snakes which adorn the Board's museum. The importation of plants and seeds by mail has also been closely scrutinized. Another most important phase of the entomological division work is the collection, propagation and distribution of beneficial insect parasites. Much excellent progress is reported in this direction.

The Division of Animal Industry was only created recently, in obedience to an enactment of April 26, 1905. Dr. Norgaard is in charge of this important work and has already accomplished much during his brief tenure of office. During his preliminary inspection of the island stock he has found the condition of affairs to be one requiring close attention. Regulations have been passed by the Board, in accordance with Dr. Norgaard's advice respecting the inspection of imported stock and other matters. Circulars have also been distributed descriptive of farcy and glanders, which latter disease has been found in more than one locality. An animal quarantine station has been established at Kalihi in consequence of this condition.

Of 100,000 sheep in the Territory, during the past year the veterinarian has personally superintended 40,000 dippings.

The Division of Agriculture, in connection with the Board, is efficiently carried on by the Federal Experiment Station. The most important work of the station has been in connection with the raising of tobacco. Great success has attended these efforts which are calculated to exercise a wide influence in the agricultural future of the islands.

Following the general epitome of the year's work, as outlined above, are the specific reports of the various officials. Mr. Hosmer's report comprises seventy pages and contains a detailed account of the year's work of the Division of Forestry. The part devoted to the practical development of the economic resources of the Hawaiian forests is of particular interest, and affords the chief index to the concrete results achieved by the division. Among the commercial enterprises enumerated and described may be mentioned the formation of the koa lumbering company to exploit the forests of Keauhou; the action of a Hilo firm in undertaking the systematic manufacture of telephone insulator pins from ohia lehua, which promises to develop into an important industry; the experiments arranged between this division and the Oahu Railway & Land Company to determine the value of ironwood railroad ties; and the experimental shipment of black wattle tan bark, as already described in a press bulletin of the Hawaii Experiment Station. Among the plans for the coming year are included the completion of the arrangements to set aside the forest reserves now pending; the establishment of a proper system of forest administration, and a continuance of the practical assistance to private tree planters as outlined in a former division publication.

Mr. David Haughs submits an account of the work which has fallen to his share during the year. This has chiefly centered around the collection and distribution of seed throughout the islands, the propagation and distribution of plants, experiments with the cultivation of rubber trees and the furnishing of advice and assistance to amateur foresters.

Brief reports then follow from various District Foresters throughout the islands, elicited in response to a circular letter from Mr. Hosmer, requesting data of importance to forestry conditions. A perusal of the replies received, affords much interesting reading as to local conditions.

The report of the librarian concludes the matter devoted to the Forestry Division.

Mr. Alexander Craw, of the Division of Entomology, then presents a synopsis of the agricultural-horticultural quarantine work performed during the period in question. The value and importance of this work can only be appreciated from a knowledge of the former experience of the islands, as it is a well conceded fact that all the insect and fungoid pests which ravage

our crops have been introduced upon plants from other countries. The loss to Hawaii in one sugar crop, two years ago, from the depredation of one imported pest alone was upwards of three million of dollars. It is safe to say that had the rigorous quarantine inspection been in operation soon enough that this enormous loss would not be now recorded. The division is now engaged upon the destruction of this insect. Among the destructive pests excluded during the past year are enemies of the sugar-cane, coconut, orange trees and many other plants.

Mr. Jacob Kotinsky's work during the year has been principally occupied in the breeding and distribution of beneficial insects; breeding and study of injurious insects and their enemies; identification of insects brought or sent to the office; classification and arrangement of collections; selection and purchase of books and supplies; the usual routine of correspondence attendant upon the above, and attention to visitors. Two circulars were written and published during the year, and, beginning with September, a popular monthly contribution on timely entomological topics was made to the Hawaiian Forester and Agriculturist. Two inter-island trips were made during the year and many official visits paid in and about Honolulu and other portions of Oahu.

A determined effort has been made to investigate the lantana insects—a work which is not yet complete. Preliminary notes are given in the report of these beneficial parasites, together with excellent illustrations, and general information of their habits. This portion of Mr. Kotinsky's work is particularly instructive and a perusal of it, by those interested in the encroachment of lantana, is to be commended. Much interesting data is also furnished by the writer on the horn flies, inoculation of the Japanese beetle, coffee diseases, and other important matters.

The report of Mr. Victor A. Norgaard, chief of the Division of Animal Industry, being the first report of the Territorial veterinarian, then follows. After a general introduction it devotes itself to the following subjects, in order: The Mallein Test for Glanders; the Prevalence of Glanders; Watering Troughs and Hitching Posts; Tuberculin Test for Tuberculosis; Scabies in Sheep; the Horn Fly Spreads Scabies; Pro-

losis; Scabies in Sheep; the Horn Fly and Scabies; Protection from Texas Fever; Big Head Among Horses; Cancer Among Cattle; Liver Fluke in Cattle; Encouragement of Hog Raising, and the Poultry Industry.

According to Dr. Norgaard, the Territory is singularly free from most of the infectious and contagious diseases which cause such heavy losses on the mainland, as well as throughout the world. The principal duty of the veterinarian will be to prevent the introduction of such diseases not already here and to devise means to eradicate those which have already gained a foothold in the Territory.

The Division of Agriculture, by Mr. Jared G. Smith, Special Agent in charge of the Hawaii Experiment Station, gives an important account of the Hamakua tobacco experiments, which are still in progress. This feature of local agricultural development is of particular importance, and from the results shown, it appears fair to predict that this industry, together with the cultivation of rubber, will soon rank in Hawaii as of equal importance as the production of coffee. Interesting information is also given relating to the following crops: Mango, banana, cacao, vanilla, rosella, avocado, rubber and coffee. The report concludes with an account of the work of the chemical laboratory of the station.

We hope that all readers who have not already received a copy of this valuable publication will avail themselves of the offer of the Board of Agriculture to forward it upon request. The work contains two hundred and forty pages of interesting information, and is well illustrated. It is of importance alike to the general agriculturist, the stock breeder, the fruit grower, and the entomologist.

WAIANAE-KAI AND LUALUALEI FOREST RESERVES.

Official action has recently been taken upon two important forest projects on the Island of Oahu, the proposed forest reserves of Waianae-kai and Lualualei. The two areas adjoin one another and in reality form one reserve. They may accordingly be considered as a unit, although taken up at different times by the Board of Agriculture and Forestry. Both reserves are situated on the western slope of the Waianae

mountains and with the exception of a few kuleanas in the Waianae-kai reserve consist wholly of government land. The area of the Waianae-kai Forest Reserve is 3257 acres, that of Lualualei 3743.

The reports regarding the Waianae-kai Forest Reserve were adopted and the resolution recommending its creation passed by the Board at its meeting held on August 8th, 1906, while similar action in regard to Lualualei was taken on October 31st, 1906.

The public hearing to consider the Waianae-kai Forest Reserve was held on September 5th, and on September 7th Governor Carter issued the proclamation officially setting the land apart.

The Lualualei hearing was held on November 28th. The proclamation of that reserve is dated November 30, 1906.

In accordance with the usual custom of the Board the reports of the Committee on Forestry (two) and of the Superintendent of Forestry (two) with the resolutions (two) adopted by the Board in regard to these two reserves are published herewith. There is also published a form of surrender signed by the Waianae Company whereby the control of the land of Waianae-kai reverts to the government on July 1st, 1908. This action was taken in order to enable the Governor to set apart the reserve under the two-year clause of the law, and also to allow new arrangements to be made for the use of the water from the reserve. It is the first time that such a step has been taken and is eloquent testimony as to what a leading plantation company thinks of the value of forest reserves.

RESOLUTION RELATING TO THE PROPOSED WAIANAE-KAI FOREST RESERVE.

Resolved, that those certain lands in the District of Waianae, Island of Oahu, bounded in general terms, as follows:

Lying on the West and North slope of the Waianae valley, bounded on the West by the land of Makaha, on the North by the land of Waianae-uka, on the East and South by a line drawn approximately along the foot of the steep mountain slope; and containing an area of 3,150 acres, more or less, as recommended by a report of the Committee on Forestry, dated August 8th, 1906, based on reports of the Superintendent of Forestry, dated April 4th and July 31st, 1906, which reports

are on file in the office of the Board of Agriculture and Forestry, the boundaries of which proposed reservation more particularly appear by and on a map and description made in May, 1906, by the Hawaiian Government Survey Department, which said map is on file in said Survey Department and marked "Registered Map Number 2372" and "Forest Reserve Waianae Valley, Waianae-kai, Oahu," copies of which said map and description are now on file in the office of this Board, and made a part hereof, be approved as a forest reserve to be called the "Waianae-kai Forest Reserve."

Resolved, that the Board recommend to the Governor that the government lands lying within the boundaries of the said proposed Waianae Forest Reserve be set apart by him, subject to vested rights therein, after the hearing required by law, as the "Waianae-kai Forest Reserve."

This resolution was adopted by the Board of Agriculture and Forestry on August 8, 1906.

RESOLUTION IN REGARD TO THE PROPOSED LUALUALEI RESERVE.

Resolved, that those certain lands in the District of Waianae, Island of Oahu, bounded in general terms as follows:

Lying on the western slope of the Waianae Mountains, bounded on the west by the Lualualei Homesteads, on the north and east by the lands of Waianae-kai, Waianae-uka and Honouliuli, on the south by the land of Nanakuli; and containing an area of 3,743 acres, more or less, as recommended by a report of the Committee on Forestry, dated August 10, 1906, based on a report of the Superintendent of Forestry, dated April 4, 1906, which reports are on file in the office of the Board of Agriculture and Forestry, the boundaries of which proposed reservation more particularly appear by and on a map made in January, 1906, by the Hawaiian Government Survey Department, which said map is on file in said Survey Department and marked "Registered Map Number 2165" and "Lualualei Forest Reserve, Oahu," and a description accompanying the same number C. S. F. 1659, which said description is on file in said Survey Department, copies of which said map and description are now on file in the office of this Board, and made a part hereof, be approved as a forest reserve to be called the "Lualualei Forest Reserve."

Resolved, that the Board recommends to the Governor that the government lands lying within the boundaries of said proposed Lualualei Forest Reserve be set apart by him, subject to vested rights therein, after the hearing required by law, as the "Lualualei Forest Reserve."

This resolution was adopted by the Board of Agriculture and Forestry on October 31, 1906.

REPORTS OF THE COMMITTEE ON FORESTRY.

WAIANA-KAI.

Honolulu, T. H., August 8, 1906.

Board of Agriculture and Forestry,
City.

Gentlemen: Your Committee on Forestry hereby report upon the proposed forest reserve on the land of Waianae-kai, District of Waianae, Island of Oahu, recommended by Forester Hosmer by report dated July 31, 1906.

Your committee are familiar with the locality in question and have consulted the leading property owners in that vicinity. The land included in the proposed forest reserve is, with the exception of a few kuleanas, all government land under lease to the Waianae Plantation, which lease has about three years to run.

The proposed reserve is the mountain country on the ridge between the valley of Waianae and Makaha and also runs along the Kaala ridge dividing Waianae from the basin in which Wahiawa is located.

The land covered by the proposed reserve is, most of it, almost inaccessible and is, all of it, suitable for forest reserve purposes. It constitutes the water shed of the entire Waianae valley and also affects the water shed of the North and East slope of the Waianae Range.

The Waianae Plantation has signified its willingness to surrender its lease on the proposed reserve for the purpose of securing the establishment of the proposed reserve and will at its own expense run a fence along the lower line of the reserve to keep out horses and cattle.

The plantation has already fenced out the upper portion of the proposed reserve and planted many trees thereon and has signified its desire and willingness to continue planting trees

on the enlarged reserve at its own expense and under the supervision of the forester.

Your committee commend the public spirited attitude and the enlightened methods shown by the Waianae Plantation in this connection.

Your Committee recommend that the Board approve of the proposed forest reserve and recommend the same to the Governor in the usual form.

Your Committee presents herewith a resolution carrying the foregoing recommendations into effect.

The Forester suggests that in the proclamation a reservation be made allowing outing house sites to be located on the land in question.

Your Committee are of opinion that such reservation is unnecessary but can be accomplished under the power of the Board to make rules and regulations concerning the administration of forest reserves.

We remain,

Your obedient servants,

L. A. THURSTON,

W. M. GIFFARD,

Committee on Forestry.

LUALUALEI.

Honolulu, T. H., Aug. 10, 1906.

Board of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen: Your Committee on Forestry beg to report that they have had under consideration the report of the Superintendent of Forestry, dated April 4, 1906, concerning the proposed forest reserve at Lualualei, District of Waianae, Island of Oahu.

This proposed reserve is adjacent to and directly east of the Waianae-kai reserve, which was approved by this Board on the 8th inst.

It extends along the crest of the Waianae mountains from Waianae-kai to Nanakuli, and from the crest down into the head of the Lualualei Valley to the homesteads recently sold by the Government. It embraces the steep foot-hills of the Lualualei Valley and the mountain above the same to the crest. It is the direct water shed of the Lualualei Valley, which is

practically an extension of the Waianae Valley, and is the sole source of water supply for the homesteads and ranches in Lualualei.

The land in question is all government land on which there is no lease.

It has been surveyed by the Territorial Survey Department and the metes and bounds accompany the recommendation of the Superintendent of Forestry. The proposed reserve contains an area of 3,743 acres. It is the unanimous opinion of the land owners, of the Land Commissioner and of every one that your Committee knows of that the land in question should be made into a forest reserve.

Your Committee therefore recommend that the recommendations of the Superintendent of Forestry to establish a forest reserve on the land of Lualualei in the locality indicated, be approved by this Board and that the same be recommended to the Governor for reservation as a forest reserve.

Your Committee herewith submit a formal resolution carrying the foregoing recommendations into effect.

We remain,

Your obedient servants,

L. A. THURSTON,
W. M. GIFFARD,
Committee on Forestry.

REPORTS OF THE SUPERINTENDENT OF FORESTRY.

April 4, 1906.

Committee on Forestry,
Board of Commissioners of
Agriculture and Forestry,
Honolulu, Oahu.

Gentlemen: I have the honor to submit herewith a partial report upon the creation of a forest reserve on the mauka portion of the government lands of Lualualei and Waianae-kai, in the District of Waianae, Island of Oahu, and to recommend certain lines as the boundary of the proposed reserve. A technical description of the boundary of the area in Lualualei proposed to be set apart forms a part of this report. Following the completion by the Survey Office of a like description for the area in Waianae-kai, I shall submit a supplementary report upon that land. The matter may therefore be brought

before the Governor in the form of two reserves, or action on Lualualei can be postponed until the Waianae-kai description is ready.

The present report is made in response to a verbal request from the Commissioner of Public Lands, in order that the forest line on Waianae-kai may be laid out by the Survey Office in connection with other work in the Waianae Valley. It is based on field work done in Lualualei and Waianae-kai in December, 1905, and March, 1906, respectively, when I carefully inspected the two valleys, as well as on information obtained from various persons familiar with the local conditions, or gathered by me while examining adjacent lands.

Situated on the leeward side of Oahu, under the shelter of Kaala, the highest peak of the Waianae Range—and also, incidentally, the highest elevation on Oahu, 4030 feet—the lands of Waianae-kai and Lualualei resemble in topography and are subject to the same general conditions of exposure and rainfall as obtain on the lands of Makua and Keaau, 8 to 10 miles along the Waianae Coast to the northward. As a somewhat detailed report has recently been submitted by me upon these lands* it is unnecessary to repeat here the general statements

PURPOSE.

The essential reasons for the creation of a forest reserve on the Lualualei and Waianae-kai lands are, by the re-establishment and maintenance of a forest cover, to assist in securing a more regular flow in the springs and brooks on the lands, and to put to economic use areas which from their topography and situation are incapable of being profitably used for any other purpose than producing trees. Much of the proposed reserve is indeed too steep and rough even for this use, but by making it a forest reserve it will later be possible to put into effect a comprehensive system of forest management, which will include the systematic extermination of the wild goats and, in cooperation with the owners or lessees of adjoining lands, a definite policy of tree planting.

* This Report was published in the Hawaiian Forester and Agriculturist for January, 1906, pp. 4 to 8. contained therein.

LOCATION AND AREA.

The section proposed to be reserved includes the area at the head of the two valleys, above the homesteads in Lualualei and above the cultivated area in Waianae-kai. The Lualualei tract may be roughly described as follows:

Lualualei: That portion of the land of Lualualei, District of Waianae, Island of Oahu, lying on the western slope of the Waianae Mountains, bounded on the West and Southwest by the mauka line of the Lualualei Homesteads, on the East and Northeast by the summit ridge of the Waianae Mountains, and on the Northwest and Southwest, respectively, by the summit ridge of the spurs dividing Lualualei from Waianae-kai and from Nanakuli.

Waianae-kai: That portion of the land of Waianae-kai, District of Waianae, Island of Oahu, lying on the Western slope of the Waianae Mountains, bounded on the Southwest and South by a line drawn from Kawaopuu to Puu Kolealilii, thence to and along the foot of the ridge dividing Waianae-kai from Makaha to the Makaha boundary; on the Northeast by the summit ridge of the Waianae Mountains, and on the Northwest and Southeast, respectively, by the summit ridge of the spurs dividing Waianae-kai from Makaha and Lualualei.

The area of the proposed Lualualei Reserve is 3,743 acres. That of Waianae-kai I do not know, but it is perhaps two-thirds that of Lualualei. Both of the lands were formerly classed as "Crown lands."

DESCRIPTION OF THE TRACTS.

As each valley presents some individual problems it may be well to consider them separately.

Lualualei.

The characteristic features of the Lualualei Forest Reserve project are the fencing problem and the existence of a public way across the area.

When the Lualualei homesteads were sold one of the provisions was that the mauka line of each lot adjoining the forest area should be fenced. The period during which this work must be done does not expire for about twenty months yet. So far none of the mauka fences have been built although

practically all of the lot owners are ready, each to fence his own lot provided all the other owners will agree to fence theirs at the same time. It is therefore merely a question of time when the work is done. As the other three sides of the reserve are bounded by mountain ridges further fencing along the boundary is unnecessary, except perhaps a short stretch on the ridge at the Kolekole Pass.

The question of fencing the trail across the reserve is, however, not so easily solved. This trail is the one leading from Waianae over the Kolekole Pass to Leilehua Ranch and beyond, and having been used from time immemorial is a recognized public way. The lower end of the trail, just above Homestead Lot No. 2, has recently been improved by the Oahu County Supervisors, but whether or not the whole length of the trail is to be put in shape I cannot say. Being a public way, it is of course impossible to close the trail and even if it were possible to do so I should not recommend it, for the trail is one that is needed in the domestic traffic of the island. Parenthetically it may be remarked that this trail possesses unusual scenic advantages, which when the trail is put in shape would, if properly advertised, make it a tourist attraction.

The objection to the trail crossing the reserve is that there is now nothing to prevent cattle from straying from it when being driven across. Ordinarily of course a band would be kept together and driven right through; but if it were so desired, in the absence of fences the cattle might be allowed to scatter and roam at will over the reserve. The only sure way to remedy this is to fence both sides of the trail from Kolekole Pass to the Homestead Lots, leaving open a suitably wide right of way. This means a double line of fence for a distance of perhaps a mile and a half. This Board certainly has no money for such a purpose and I see no way to obtain the money except by an appropriation by the Legislature.

A temporary solution of the difficulty could, I think, be effected by securing the coöperation of the few companies or individuals who are accustomed to use this trail to drive cattle across the mountains, whereby they would agree to keep the band together and drive them right through. If this could be arranged, the forest ranger for the district, who it is expected

can be appointed next year, could do much to keep ordinary strays in check.

For these reasons I believe that the present lack of ability to fence in the trail should not stand against the creation of this area as a forest reserve.

It has been suggested by certain gentlemen interested in the Lualualei homesteads that a trail should be laid out above the homestead lots to connect Lots 3 to 7 with the regular trail over the Pass. But as the mauka line of the homesteads in several places runs to steep ridges, over which it is impracticable to build a trail, it would be necessary that such a trail be laid out across rather than above the homestead lots.

While some of the land above the homesteads in Lualualei could be and now is used for grazing it is believed that it would be of greater benefit not only to the Territory as a whole, but also to those persons having interests in Lualualei Valley, to have this section covered with forest. Above the homesteads there are a number of springs, some of which have in late years run dry. There is no reason to doubt that were the slopes above these springs again forested, water could be developed from them. It is true that the catchment area is limited, but if the retentive cover of vegetation that goes to make up the forest were restored a good share of the rain that does fall would be saved and could be turned to account. So too a forest cover on these upper slopes would assist in holding some of the flood water which in times of heavy rain is now lost.

I understand that the mauka line of the Lualualei Homesteads was fixed where it is by the personal direction of ex-Governor Dole, with special reference to this very forest question at a time when there was more forest than at present upon these lands. From evidence in the gulches and elsewhere there seems to be no doubt that if protected from cattle the area would again become covered with trees. It seems to me that the mauka line of the homesteads is the best line which could be chosen and I accordingly recommend it as the lower line of the Lualualei Forest Reserve.

Recommendations.

As the area proposed to be reserved is government land not now under lease it can be declared a reserve and set apart by

the Governor at any time. For the reasons stated above I recommend that the Board take the requisite action to cause this area to be set apart as the Lualualei Forest Reserve.

Below is the technical description of the proposed Lualualei Forest Reserve boundary, prepared by Mr. F. E. Harvey of the Survey Office. It may be noted that the area of the reserve, 3,743 acres, is less than the balance of Lualualei not under lease, called for in the last Land List. This is accounted for by the fact that the reserve does not take in certain lands makai and to the Southwest of Lot No. 7. Following is the description:

[The technical description is here omitted as it will later be published as a part of the official proclamation.]

The original of the above description is filed in the Territorial Survey Office as C. S. F. 1659. The area is 3,743 acres.

Waianae-kai.

In Waianae-kai the water question is also the predominant one and forms the reason for the creation of a forest reserve in this valley. In this case the water is needed for the development of power and the irrigation of cane on leased government land. Some water is also needed for use on various native kuleanas. The whole land of Waianae-kai is now under lease to the Waianae (Plantation) Company—to run until July 1, 1900—but as the lessees are desirous of effecting a new settlement some arrangement as to the setting apart of the forest land can probably be arrived at before the two-year limit, by the surrender of a part of the land leased or otherwise. The total area of Waianae-kai is 5,510 acres. The area of forest and waste land is approximately 3,000 acres.

It is the desire of the plantation that all the land above a line drawn from Kawaopuu to Puu Kolealiili and from the latter point to the pumping station at the makai end of the ridge making the Northern side of the valley, be created and set apart as a forest reserve. At present some of the upper land is used for grazing cattle belonging to the plantation but this department is soon to be given up and the cattle removed.

In fixing the forest line the question of the availability of any of the upper land for agriculture was carefully considered. Above the line recommended in this report there is, with the exception of the old coffee plantation to be discussed later, no

land now under cultivation, and so far as I could learn, with the exception of a few kuleanas now owned by the plantation, the only use to which the land had for many years been put, was grazing.

On the upper South side of the valley, next to the Kawaopuu ridge, the land rises more gradually than elsewhere and could perhaps be used for some crop, but here comes in the question of a water supply for, if this section were so used, water would have to be diverted from use on much better land below, the wisdom of which is at least questionable. Furthermore as the elevation of this moderately sloping land is greater than the elevation of the power house, the diversion of water would also interfere with that use, while for the land lower down the valley the water that has already turned the power wheels can be used for irrigation.

Almost all of the land within the area proposed to be reserved is rocky and on the Northwestern side of the valley most of it is in addition covered with a heavy growth of cactus. The cactus belt extends all the way from the pumping station along the base of the ridge, up the valley to Puu Kolealiilii, coming down to the cane fields or to the road. At the upper end stone walls have been built within the last few years to keep the cattle out of the cactus. These walls could well be utilized as the actual forest reserve boundary, although to provide for a time when some use may be found for this easily accessible though rocky and now cactus covered land, the official line should run from Puu Kolealiilii to the most Northerly point of the cane fields. One of the stone walls runs from Puu Kolealiilii to an enclosure known as the "Bullock Pen" on the main road up the valley, where it meets another wall enclosing the cane fields lower down.

Lower down the valley the land above the proposed forest line is too rocky to be used for any economic purpose, while that further mauka should, it is believed, for the reasons already pointed out, be kept as forest.

In the upper part of the Waianae Valley is the old coffee plantation established by the late Judge H. A. Widemann. As a profitable venture coffee growing has not proved a success, although large sums have been expended in attempts to make it so. The plantation has now been practically abandoned

although for the last few years a few Japanese have picked the crop on contracts, usually at a loss to the Waianae Company. The fruit trees seem to have fared no better so that from a financial standpoint the experiment must be counted a failure.

As a mountain outing place the lot has possibilities, however, and I see no reason why it should not be so used. The presence in the forest reserve of such a place, well kept up and cared for, would insure better protection against forest fire, for one or more men would be always at hand in case of an emergency of that kind. Furthermore by keeping the road and trails open regular fire fighting gangs could be got in quickly should that be necessary.

If the place were to be sold or leased—and it seems a pity after so much money has been spent that it cannot be turned to account in some way—it would be well to have clauses in the deed or lease making it obligatory on the owner or lessee to conform to certain simple regulations and assist in times of need in protecting the reserve from fire.

Of the other coffee plantation in Waianae, sometime owned by Mr. Carl A. Widemann, there are left so few traces that had not some exotic trees been planted the stranger would search for it in vain.

In connection with the creation of the upper part of the Waianae Valley a forest reserve, the Waianae Company is ready to consider carrying into effect a plan to reforest certain of the upper lands, within the reserve, by systematic tree planting. Just where and how much of this work would be done cannot now be told, but if once started it is probable that considerable areas would be planted. On the lower lands and especially among the cactus it would be a good thing to extend the algaroba forest and in many places this could easily be done by pasturing out a few horses fed in part on algaroba pods.

Recommendations.

For the reasons above set forth I therefore recommend that when a technical description of the boundary is in hand, the Board pass a resolution favoring the reservation of the upper part of the land of Waianae-kai as the Waianae-kai Forest Reserve, and requesting the Governor to set apart the land for

that purpose, as by that time a definite arrangement will, without doubt, have been reached with the Waianae Company regarding the surrender of their present lease. As soon as a technical description is prepared by the Survey Office I will submit it as a supplementary report. In the meantime I submit the following popular description of the proposed line:

Starting at Kawaopuu on the Lualualei-Waianae-kai boundary, the line should run in a Northwesterly direction to Puu Kolealiilii, thence in a general Southwesterly direction to the most Northerly point of the cane fields, where the power wire line leaves the cane and enters the cactus; thence makai along the stone wall bordering the cane fields to a point on the edge of a dry gulch where the said wall turns abruptly to the East; thence along the top of the Southern bank of said dry gulch to the East end of the wooden trestle crossing it, which trestle is on the upper flume line, the second north from the main road; thence following the flume line, or a line parallel to and 50 feet, more or less, mauka of it to the pumping station; thence on the same contour to the Waianae-kai-Makaha boundary; thence mauka following said boundary line to the crest of the Waianae Range; thence along the summit ridge to the spur on which is Puu Kawaopuu, thence down said spur to the initial point.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

WAIANA-KAI.

July 31, 1906.

Committee on Forestry,
Board of Agriculture and Forestry,
Honolulu, Oahu.

Gentlemen: I have the honor to submit the following as a supplementary and final report upon the proposed forest reserve on the land of Waianae-kai, District of Waianae, Island of Oahu, covering and including the technical description and enclosed map prepared by the Territorial Survey Office, in accordance with the recommendations in my report to you dated April 4th, 1906.

I would here add one recommendation to those contained in my preliminary report. In that report I stated that in my judgment there would be no impropriety in using the old coffee plantation of the late Judge Widemann as a mountain outing place, provided it were made mandatory for the lessee to observe certain simple regulations looking to the welfare of the forest reserve. There is opportunity on the government land in the vicinity of this grant to lay out one or more small lots which could be used for a similar purpose. If restricted by properly worded clauses in the lease or deed I believe that the use of a limited area of the proposed reserve for outing house sites would be a benefit rather than a detriment to the reserve, as well as in part meeting what seems to be an increasing demand on this island. As no locations have as yet been made I recommend that a clause be inserted in the reserve proclamation, excepting from the reserve such limited areas, not to exceed 100 acres in all, in the vicinity of Grant No. 4040, as may hereafter be laid out under the direction of the Superintendent of Forestry for lease or sale as mauka outing house lots.

As the necessary data in regard to the proposed Lualualei and Waianae-kai Reserves are now in hand, I recommend that a resolution in regard to the creation of these reserves be prepared and presented to the Board by the Committee on Forestry, that these projects may be brought to the attention of the Governor and take the usual course.

Following is the description of the proposed Waianae-kai Forest Reserve boundary prepared by the Government Survey Office, where the original is filed as C. S. F. No. 1737.

[The technical description is here omitted, as it forms a part of the official proclamation.]

Kuleanas and Grant in above Reserve, viz.:

	Acres.
L. C. A. 3087 to Kanepaina, area.....	5.
L. C. A. 3131 to Kuapuu, area.....	3.136
L. C. A. 3133 to Ohule Ap. 1, area.....	5.655
Grant 4040 to H. A. Widemann, area.....	93.
	<hr/>
	106.701

Total area of Reserve.....	3257.000
Less	106.791
	<hr/>
Balance	3150.209

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

SURRENDER OF LEASE OF WAIANAE-KAI.

This Indenture, made this 4th day of September, 1906, by and between Waianae Company, an Hawaiian corporation, of the first part, and J. W. Pratt of Honolulu, Island of Oahu, Territory of Hawaii, Commissioner of Public Lands for the Territory of Hawaii, of the second part,

Witnesseth: That the parties hereto do hereby mutually covenant and agree that the term of that certain indenture of lease dated the 11th day of September, 1879, made between The Commissioners of Crown Lands of the first part and H. A. Widemann of the second part, and of record in liber 63, pages 41-44, Hawaiian Registry of Conveyances (being Government lease No. 60), which term was for twenty-five years from July 1, 1879, and thereafter extended for five years to commence from the first day of July, 1904, shall be reduced one year so that such term as extended shall expire on the first day of July, 1908, and the said lease shall hereafter be read and construed as if the term of the said lease with the five years' extension were twenty-nine (29) years instead of thirty (30) years.

In Witness Whereof the parties hereto have hereunto and to another instrument of the same date and tenor set their hands and seals the day and year first above written.

WAIANAE COMPANY,

By its Vice-President,

(Seal)

J. O. Carter,

By its Secretary,

J. M. Dowsett.

(Seal) Jas. W. Pratt,

Commsr. Pub. Lands, T. H.

MAUI FOREST LAND SURRENDER.

November 12, 1906, is entitled to be regarded as an important date in the forest history of Hawaii, for on that day were signed the final papers in a coöperative agreement whereby an area of privately owned forest land within an Hawaiian forest reserve was for the first time turned over to the Board of Agriculture and Forestry for management.

The lands of which the care, custody and control are relinquished are in the Koolau Forest Reserve on Maui and are owned by the plantations controlled by Alexander & Baldwin. The surrender is made under the authority of Section 384, Chapter 28, of the Revised Laws of Hawaii, which provides that "any person or persons, corporation or corporations, may at any time surrender to the government the care, custody and control of any lands, whether held under lease or in fee, as a forest reservation, either for one or more years or forever. No taxes shall be levied or collected upon any private land so surrendered for the purposes aforesaid, so long as the same shall remain exclusively under the control of the government as a forest reservation."

The lands now turned over to the Board have for a number of years been treated as a private forest reserve, but when the Koolau Forest Reserve was created by proclamation of Acting Governor Atkinson on August 24, 1905, Mr. H. P. Baldwin agreed to coöperate with the government so that an organic plan of forest management might be put into operation for the reserve as a whole. Accordingly the matter was turned over to his attorneys, Messrs. Smith and Lewis, with the result that there have been prepared and finally executed three transfers, respectively from the Paia Plantation, the Haiku Sugar Company and the Hawaiian Commercial & Sugar Company. As the three documents are identical in all essential points, except for the difference in names, only one is reproduced here, that of the Paia Plantation.

While formidable in legal phraseology, the purpose of these documents is simple. The gist of the matter is that the plantations turn over to the government for the term of seventeen years from February 26, 1906, the care, custody and control of the privately owned lands of Halehaku, Haiku, Opana and

Kaupakalua within the boundaries of the Koolau (Maui) Forest Reserve. They except and reserve, however, (1) all water rights, (2) rights of way for roads, ditches, tunnels and pipe lines, (3) the right to plant trees, (4) the right to cut fence posts for local use, and (5) the right to make economic use of the forest subject to reasonable rules and regulations of the Board of Agriculture and Forestry and in a way not inconsistent with the purposes of the reserve. Under each of these reservations are included the rights of ingress and egress. The plantations agree, in addition, to keep the makai boundary of the reserve fenced.

The surrender is made contingent on the following points: (1) that the land surrendered be used by the government solely for forest purposes, (2) that all government lands within the reserve be set apart now or as soon as may be as parts of the reserve, (all those that can be reserved under the law have already been set apart), (3) that if all or any portion of the two tracts of government land covered by Leases Nos. 538 and 539 revert to the government during the seventeen years, such lands shall be added to the reserve, and (4) that all government lands within the reserve shall be used only for forest purposes during the period of the surrender, except that the government may exercise similar rights to those reserved to the plantations. Failure on the part of the government to comply with these conditions nullifies and terminates the whole agreement. The term of seventeen years expires on the same day as do the leases (Nos. 538 and 539) for the government lands adjoining the private lands surrendered.

Owing to the number of corporations involved it appeared necessary to make use of the elaborate form followed. In many cases it is probable that a very much simpler agreement would answer the purpose and be equally satisfactory. Already several individuals and corporations are preparing to enter into arrangements similar in scope and purpose to that here described. It is earnestly to be hoped that many others will follow suit, for only by the systematic coöperation of the owners of private forest land with the government in the management of the reserves as a whole can the forest reserves of Hawaii be made in the fullest degree to accomplish the ends for which they are created.

Following is the full text of the agreement between the Paia Plantation and the government :

THIS INDENTURE, made this 20th day of August, 1906, by and between PAIA PLANTATION, an Hawaiian corporation, party of the first part, the TERRITORY OF HAWAII, party of the second part, and PAIA PLANTATION, HAIKU SUGAR COMPANY, KALIALINUI PLANTATION COMPANY, LIMITED, PULEHU PLANTATION COMPANY, LIMITED, KULA PLANTATION COMPANY, LIMITED, MAKAWAO PLANTATION COMPANY, LIMITED, and KAILUA PLANTATION COMPANY, LIMITED, all Hawaiian corporations, a co-partnership under the name of the MAUI AGRICULTURAL COMPANY, said parties being hereinafter referred to as the Maui Agricultural Company, parties of the third part :

Whereas, a large portion of the lands situate in the districts of Hamakualoa and Koolau, Island of Maui, Territory of Hawaii, is covered with forest, and the chief value of said lands lies in the water conserved by said forest, which said water supplies the central Maui sugar companies, including said Paia Plantation; and

Whereas, said forest is situate on land principally owned by said Territory of Hawaii, which derives a large revenue from rents and from water license fees for the water obtained therefrom; and

Whereas, large areas of said districts are also owned by said Paia Plantation, the Haiku Sugar Company, an Hawaiian corporation, and the Hawaiian Commercial and Sugar Company, a California corporation; and

Whereas, it is to the interest of said Territory of Hawaii and said Paia Plantation, Haiku Sugar Company and Hawaiian Commercial and Sugar Company, and of the general public that said forest lands be maintained and forest reserves established thereon; and

Whereas, it has been agreed between said Territory and said Paia Plantation, Haiku Sugar Company and Hawaiian Commercial and Sugar Company that a forest reserve shall be set apart in said Districts of Hamakualoa and Koolau, Island and Territory aforesaid, within the boundaries hereinafter specifically set forth; and

Whereas, by due procedure according to law, the Acting Governor of the Territory of Hawaii did, on the 24th day of August, 1905, establish and describe a Forest Reserve in the said Districts, and duly issue a proclamation dated August 24th, 1905, setting apart and describing said Forest Reserve by metes and bounds, as more fully appears by said proclamation on file in the office of the Governor of the Territory of Hawaii, and by the map of said Forest Reserve on file in the territorial survey office C. S. E. 1630, which said proclamation and map are hereby referred to for greater certainty; and

Whereas, said Maui Agricultural Company, by and under that certain Partnership Agreement between them, dated October 30, 1903, have or may have acquired some rights or interests in the lands of which the care, custody and control are hereby surrendered to said Territory by said Paia Plantation within said boundaries, or in respect thereof;

NOW THEREFORE, THIS INDENTURE WITNESSETH, that said Paia Plantation, in consideration of the premises and of One Dollar (\$1) to it paid by said Territory of Hawaii, the receipt whereof is hereby acknowledged, does hereby surrender for forestry purposes unto said Territory of Hawaii the care, custody and control of all that portion of the land of Halehaku, of the land of Opana and of the land of Kaupakalua, lying within said boundaries owned by said Paia Plantation, as well as all other lands and portions of land lying within said boundaries owned by said Paia Plantation, said boundaries being particularly described as follows, to-wit:

Beginning at a point on the boundary line between the Districts of Hana and Koolau, Island of Maui, Territory of Hawaii, where the mauka boundary of the Nahiku Homesteads if projected easterly would intersect the said District line, the boundary runs:

1. In a general northwesterly direction to and along the mauka boundary of the Nahiku Government Homesteads to the gulch between the land of Kapaula and Puakea, or Paakea, said gulch being also named Waiaka Gulch on Public Lands Map No. 20 of Nahiku, about 22,000 feet in a direct line;

2. Thence makai, down said Waiaka Gulch to the Koolau Ditch, about 2800 feet in a direct line;

3. Thence in a general westerly direction along the Koolau and Upper Hamakua Dutch trail to the western boundary of the land of Opana, in the District of Hamakualoa, about 61,000 feet in a direct line;

4. Thence mauka along the westerly boundary of said Opana to the makai boundary of the land of Haiku-uka, belonging to the Haiku Sugar Company and Paia Plantation, about 20,000 feet in a direct line;

5. Thence in a general westerly direction, along the makai boundary of the said Haiku-uka land of the Haiku Sugar Company and Paia Plantation, to the Moliko Gulch, near Pali o Ka Moa, about 2000 feet in a direct line;

6. Thence south 34° east, true 17,800 feet, along the land of Makawao to the summit of the hill called Puu o Kakao;

7. Thence south $53^{\circ} 21'$ east, true 42,980 feet, along the land of Kaliahuni, crossing the Koolau Gap, to Pohaku Oki Aina;

8. Thence, in a general easterly direction, along the northern crest of the Kipahulu Valley to a point where the boundary line between the Districts of Koolau and Hana intersects the Kipahulu Valley, about 10,000 feet in a direct line;

9. Thence, in a general northeasterly direction, along the said boundary line between the said Districts of Koolau and Hana to the point of beginning, about 21,500 feet in a direct line, containing an area of 42,969 acres, more or less, the various distances in the above description being approximate only, being scaled from the said map showing the Reserve boundary;

TO HAVE AND TO HOLD the care, custody and control of the said surrendered premises for forestry purposes unto said Territory of Hawaii for a period of seventeen years from the 26th day of February,

1906. *subject*, however, to the terms of that certain deed of mortgage and trust executed by said Paia Plantation to the Hawaiian Trust Company, Limited, dated September 28, 1903, recorded in the office of the Registrar of Conveyances, in Honolulu, Island of Oahu, Territory of Hawaii, in Liber 251, on pages 179-208, to secure the payment of bonds issued thereunder;

EXCEPTING AND RESERVING unto said Paia Plantation, and its successors and assigns, from the said surrendered premises and from the operation of this surrender, however, all water rights, and the right to develop for additional water in and upon said lands for any purpose whatsoever;

And also full right of ingress and egress, and rights of way for ditches, roads, pipe lines and tunnels and any other device for the purpose of developing and removing said water, and doing any work incidental thereto, said rights of ingress and egress and rights of way to extend from every point upon said lands to every place bounding said lands.

And also the right to plant such trees and shrubs on said surrendered lands as it, said Paia Plantation, may desire, and the right of ingress and egress for that purpose;

And also the right to cut fence posts upon said lands for fencing any of said surrendered lands, and the right of ingress and egress for the purpose of securing such fence posts, as well as of constructing such fences;

And also the right to make economic use of the forest now or hereafter on said surrendered lands, subject to such reasonable rules and regulations for the protection and development of the forest reserve hereinafter provided for on said surrendered lands as may be made by the Board of Agriculture and Forestry of said Territory or such other department as may succeed to the functions of said Board, and also the right to use and enjoy said surrendered lands for any purpose not inconsistent with the establishment, use, maintenance and development hereinafter provided for of said lands as a forest reserve, such use of said forest and use and enjoyment of said surrendered lands to be made in such manner that will not materially interfere with the conservation of said water supply on said surrendered lands, as well as also the right of ingress and egress for such purposes, such rights of ingress and egress as well as all other rights of ingress and egress and rights of way herein reserved to extend from every point upon said surrendered lands to every place bounding said lands.

And the said Paia Plantation covenants with said Territory of Hawaii that it, said Paia Plantation, will during said period of seventeen years covered by this surrender, fence or cause to be fenced and will keep fenced or cause to be kept fenced the lands of which the care, custody and control are hereby surrendered along the makai boundary of said forest reserve, the boundaries of which said forest reserve being the same as the boundaries hereinbefore specifically set forth, wherever it is necessary so to do to exclude live stock from said forest reserve.

PROVIDED, NEVERTHELESS, AND THIS SURRENDER IS MADE UPON THE FOLLOWING EXPRESS CONDITIONS:

1. That the lands of which the care, custody and control are hereby surrendered shall be immediately set apart as a forest reserve for forestry purposes in accordance with the general purposes of the present forestry laws of the Territory of Hawaii.

2. That all lands now held and owned by said Territory of Hawaii and that it may hereafter acquire during said period of this surrender, upon such acquisition, within said boundaries hereinbefore specifically set forth, *except* the lands within said boundaries covered by Government Leases Nos. 538 and 539, both dated February 26, 1902, made by the Commissioner of Public Lands for and on behalf of the Territory of Hawaii to H. P. Baldwin, shall likewise be immediately set apart as a forest reserve for said purposes, as far as and as soon as it is able so to do under the laws of said Territory;

3. That at least immediately upon the relief or release within said period of this surrender of all, or any part, of the lands covered by said Government Leases Nos. 538 and 539, from said leases, or either of them, by expiration or termination or otherwise, the lands within said boundaries so relieved or released shall be set apart as a forest reserve for said purposes; *but*, if possible under the laws of said Territory at any time within said period of this surrender before such relief, release or releases, then as soon as thus possible, the lands within said boundaries covered by said leases shall be set apart as a forest reserve for said purposes;

4. That all lands set apart as hereinbefore specified as a forest reserve and all lands now held, controlled or owned by said Territory of Hawaii, within said boundaries that have already been set apart as a forest reserve for said purposes, shall be used and maintained during said period of seventeen years covered by this surrender as a forest reserve for forestry purposes according to the general purposes of the present forestry laws of the Territory of Hawaii, except where such use and maintenance will be inconsistent with the rights now existing of third persons in any of said lands, in which cases, upon the termination of any such right or rights, such use and maintenance shall immediately being in the lands relieved therefrom and shall thereafter continue throughout said period of seventeen years covered by this surrender;

Excepting and Reserving, however, to said Territory of Hawaii from all lands owned by said Territory that said Territory has, or may, set apart as a forest reserve according to the terms of this surrender, the following rights to the extent that such rights are now owned or held by said Territory and subject to all existing rights held or owned by, or belonging to parties, including the parties of the first and third parts hereto, other than said Territory;

All water rights and the right to develop for additional water in and upon said lands for any purposes whatever;

Full rights of ingress and egress, rights of way for ditches, roads, pipe lines and tunnels and any other device for the purpose of develop-

ing and removing said water, and doing any work incidental thereto, said rights of ingress and egress and rights of way to extend from every point upon said lands to every place bounding said lands and to all places beyond:

The right to plant such trees and shrubs on said lands as it, said Territory, may desire, and the right of ingress and egress for the purpose:

The right to cut fence posts upon said lands for fencing any of said lands, and the right of ingress and egress for the purpose of securing such fence posts as well as of constructing such fences:

The right to make economic use of the forest now or hereafter on said lands, subject to such reasonable rules and regulations for the protection and development of the forest reserve herein provided for on said lands as may be made by the Board of Agriculture and Forestry of said Territory or such other department as may succeed to the functions of said Board, and also the right to use and enjoy said lands for any purpose not inconsistent with the establishment, use, maintenance and development herein provided for of said lands as a forest reserve, such use of said forest and use and enjoyment of said lands to be made in such manner that will not materially interfere with the conservation of said water supply on said lands, as well as also the right of ingress and egress for such purposes, such rights of ingress and egress, as well as all other rights of ingress and egress and rights of way to be reserved, as aforesaid, to said Territory, to extend from every point upon said lands to every place bounding said lands and to all places beyond.

BUT UPON ANY DEFAULT in the performance or observance of any of the foregoing conditions or any part thereof on the part of said Territory to be kept, observed and performed, said Paia Plantation, its successors or assigns, may thereupon, or at any time thereafter, notwithstanding any prior or other waiver of any prior breach of condition, with or without suit and without notice or demand, enter upon said lands hereby surrendered by said Paia Plantation and thereby determine the right to the care, custody and control hereby given to said Territory of Hawaii and resume entire possession of said lands, and the full use, enjoyment, care, custody and control thereof shall thereupon revert to and vest absolutely in said Paia Plantation, its successors or assigns, and its obligations under this indenture and said agreement with said Territory of Hawaii shall thereupon be discharged.

And said MAUI AGRICULTURAL COMPANY, in consideration of the premises and of One Dollar (\$1) to them paid by said Territory of Hawaii, the receipt whereof is hereby acknowledged, do hereby covenant and agree with said Territory of Hawaii that, as far as said Maui Agricultural Company are concerned and interested in said lands under said Partnership Agreement between said Maui Agricultural Company, dated October 30, 1923, hereinbefore referred to, the lands of which the care, custody and control are hereby surrendered by said Paia Plantation, may be set apart immediately by said Territory of Hawaii as a forest reserve for said purposes and said lands may be used and maintained as a forest reserve for said purposes during said period of this surrender, and

said Territory of Hawaii may have the care, custody and control of said lands for said purpose during said period.

EXCEPTING AND RESERVING, however, unto said Maui Agricultural Company and their successors and assigns, and from the operation of the foregoing covenant and agreement of said Maui Agricultural Company, all rights and interests that they have, or may have, by and under said Partnership Agreement in said lands, or in respect thereof, not inconsistent with the purposes or accomplishment or fulfillment of the objects as herein set forth of the surrender herein by said Paia Plantation, including within said exception and reservation all rights that said Maui Agricultural Company, would, or may, have under said Partnership Agreement in the rights reserved and excepted herein, and all exceptions and reservations herein made, by said Paia Plantation.

BUT UPON ANY DEFAULT in the performance or observance of any of the foregoing conditions, upon which the surrender of said Paia Plantation herein is made, or any part thereof, then the rights given by and under the foregoing covenant and agreement of said Maui Agricultural Company shall cease, *either* at and upon the election of said Maui Agricultural Company, said election to be evidenced by written notice thereof given by said Maui Agricultural Company, their successors or assigns, to the Governor of said Territory of Hawaii then holding office, and said Maui Agricultural Company may thereupon, notwithstanding any prior or other waiver or any prior breach of condition, without further notice, enter upon said lands and resume their rights therein and the use, enjoyment, care, custody and control thereof as they existed prior to said covenant and agreement, *or*, upon the consummation of the forfeiture of the rights by this indenture conferred by the entry of said Paia Plantation on account of breach of condition as hereinbefore provided.

IN WITNESS WHEREOF said Paia Plantation, party of the first part, has caused these presents to be executed and its corporate seal to be hereunto affixed by its proper officers thereunto duly authorized, and said Territory of Hawaii, said party of the second part, has caused these presents to be executed and its great seal to be hereunto affixed by George R. Carter, Governor, and James W. Pratt, Commissioner of Public Lands, and said Haiku Sugar Company, said Kalialinui Plantation Company, Limited, said Pulehu Plantation Company, Limited, said Kula Plantation Company, Limited, said Makawao Plantation Company, Limited, and said Kailua Plantation Company, Limited, which, together with said Paia Plantation are the parties of the third part hereto, have each of them caused these presents to be executed and their corporate seals to be hereunto affixed by their proper officers thereunto duly authorized, the day and year first above written.

(Seal) PAIA PLANTATION.

By (Sig.) H. P. Baldwin,
Its President.

and " J. Waterhouse,
Its Treasurer.

- (Seal) TERRITORY OF HAWAII.
 By (Sig.) G. R. Carter,
 Governor.
 and " Jas. W. Pratt,
 Commissioner of Public Lands.
- (Seal) HAIKU SUGAR COMPANY,
 By (Sig.) H. P. Baldwin,
 Its President.
 and " J. Waterhouse,
 Its Treasurer.
- (Seal) KALIALINUI PLANTATION COMPANY, LIMITED.
 By (Sig.) H. P. Baldwin,
 Its President.
 and " J. Waterhouse,
 Its Treasurer.
- (Seal) PULEHU PLANTATION COMPANY, LIMITED.
 By (Sig.) H. P. Baldwin,
 Its President.
 and " J. Waterhouse,
 Its Treasurer.
- (Seal) KULA PLANTATION COMPANY, LIMITED.
 By (Sig.) H. P. Baldwin,
 Its President.
 and " J. Waterhouse,
 Its Treasurer.
- (Seal) MAKAWAO PLANTATION COMPANY, LIMITED.
 By (Sig.) H. P. Baldwin,
 Its President.
 and " J. Waterhouse,
 Its Treasurer.
- (Seal) KAILUA PLANTATION COMPANY, LIMITED.
 By (Sig.) H. P. Baldwin,
 Its President.
 and " J. Waterhouse,
 Its Treasurer.

The words "and to all places beyond" were erased on 4th and 51
 and 29th lines, page 5, before execution.

(Signed) JOHN GUILD, (Seal)
 Notary Public.

Territory of Hawaii, }
Island of Oahu, } ss.

On this 22nd day of August, A. D. 1906, personally appeared before me G. R. CARTER, known to me to be the person described in the foregoing instrument, who executed the same by subscribing thereto the name of the TERRITORY OF HAWAII, and his own name as the GOVERNOR of said Territory; who acknowledged to me that he executed the same in the name and behalf of said Territory of Hawaii, as GOVERNOR thereof, freely and voluntarily, as the free act and deed of said Territory, for the uses and purposes therein set forth.

(Seal)

(Signed) JOHN GUILD,
Notary Public,
First Judicial Circuit.

Territory of Hawaii, }
Island of Oahu, } ss.

On this 21st day of August, A. D. 1906, personally appeared before me H. P. Baldwin and J. Waterhouse, to me known, and by me known to be the President and the Treasurer, respectively, of each of the following Hawaiian Corporations, as described in the foregoing instrument by them executed as such Officers, to-wit: Paia Plantation, Haiku Sugar Company, Kaliahinui Plantation Company, Limited, Pulehu Plantation Company, Limited, Kula Plantation Company, Limited, Makawao Plantation Company, Limited, and Kailua Plantation Company, Limited; and said H. P. Baldwin and J. Waterhouse severally acknowledged to me that they so executed said instrument freely and voluntarily, in the names and behalf of said corporations hereinabove named, as well in the execution thereof by said corporations as individual corporations as in their execution thereof under the name of Maui Agricultural Company, by themselves respectively as co-partners in said firm, in each case as the free act and deed of said several corporations, individually and as such co-partners, for the uses and purposes therein set forth.

Witness my hand and seal this 21st day of August, A. D. 1906.

(Seal)

(Signed) JOHN GUILD,
Notary Public,
First Judicial Circuit.

Territory of Hawaii, }
Island of Oahu, } ss.

On this 4th day of October, A. D. 1906, personally appeared before me JAS. W. PRATT, known to me to be the person described in the foregoing instrument, who executed the same by subscribing hereto the name of the TERRITORY OF HAWAII, and his own name as COMMISSIONER OF PUBLIC LANDS of said Territory, who acknowledged

to me that he executed the same in the name and behalf of said Territory of Hawaii, as COMMISSIONER OF PUBLIC LANDS thereof, freely and voluntarily, as the free act and deed of said Territory, for the uses and purposes therein set forth.

(Seal)

(Signed) JOHN GUILD,
Notary Public,
First Judicial Circuit.

BY AUTHORITY.

PROCLAMATION OF FOREST RESERVE IN THE DISTRICT OF WAIANAE, ISLAND OF OAHU.

WAIANAE-KAI FOREST RESERVE.

UNDER and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of the Territory of Hawaii, enacted February 27, 1905, and amended by Act 65 of the Session Laws of the Legislature of 1905, and of every other power me hereunto enabling, I, GEORGE R. CARTER, Governor of the Territory of Hawaii, having duly given the notice and held the hearing as in said Acts provided, do hereby approve as a Forest Reserve that certain piece of government land lying on the West and North slope of the Waianae Valley, on the Island of Oahu, bounded on the West by the land of Makaha, on the North by the land of Waianae-uka, on the East and South by a line drawn approximately along the foot of the steep mountain slope, in the District of Waianae, Island of Oahu, Territory of Hawaii, more particularly described by and on a map made in May, 1906, by the Hawaiian Government Survey Department, which said map is on file in said Survey Department and marked Registered Map Number 2372, and a description accompanying the same, numbered C. S. F. 1737, which said description now on file in said Survey Department, is as follows:

Commencing at the Government Survey Station Kawaopuu on the ridge between Waianae Valley and Lualualei, said Station being on the mauka side of the gap at Puca. From this Station the following Government Survey Stations bear by true azimuth: Kuwale 45° 47', 3695 feet and Pahechee mauka 43° 35', 11,147 feet and running thence by true azimuth as follows:

1. 162° 1' 54.26 feet across valley to a pile of stones on the South summit of Kolealiili. From this pile of stones the following Government survey Stations bear by true azimuth Pahechee mauka 24° 26' 30", 14,512 feet, and Kuwale 7° 10', 7778 feet;

2. 65° 14' 9.53 feet down side of Kolealiili hill across stream and up bank of gulch to a cross cut on a smooth flat rock 8 feet North Easterly from corner of stone wall;

3. 69° 51' 8.25 feet along stone wall crossing stream to a large rock at junction of stone walls. From the rock the following stations bear by true azimuth: Kawaopuu 323° 29' 30", 5570 feet, and Kuwale 354° 37', 7085 feet;

4. $33^{\circ} 27' 30''$ 5315 feet through cactus to a stone marked thus (arrow, horizontal) at edge of gulch and 22.5 feet Northerly from the North corner of stone wall enclosing cane field. From the above rock the following Stations bear by true azimuth Kawaopuu $270^{\circ} 28' 30''$, 6250 feet, Kuwale $306^{\circ} 8'$, 4448 feet, and Paheehee mauka $10^{\circ} 1'$, 8242 feet;

5. Thence $38^{\circ} 40'$ 22.5 feet to North corner of stone wall enclosing cane field and along stone wall on North side of cane and South edge of gulch to the end of the stone wall at fence, thence $25^{\circ} 40'$, 242 feet to a rock marked with a cross. The direct bearing and distance from rock marked thus (arrow, horizontal) to rock marked with a cross being $44^{\circ} 1'$, 2566 feet;

6. $67^{\circ} 8'$ 1383 feet to a stone marked thus (arrow, pendicular) on South edge of gulch and 54 feet from center of bend in flume from pumps at Kamaile to Lualualei. From this stone the following Stations bear by true azimuth: Kuwale $272^{\circ} 1' 30''$, 6656 feet, and Paheehee mauka $340^{\circ} 10'$, 5957 feet;

7. Thence in a Westerly direction parallel to and 50 feet North of the center line of the above flume to a cross on a rocky point on the Kamaileunu Ridge mauka of the pumps at Kamaile. The center line of the flume is located as follows: From the above mentioned rock marked thus (arrow, perpendicular) run by true azimuth $22^{\circ} 8'$ 54 feet to center of flume at bend. Thence along center line of flume.

1. $113^{\circ} 2'$ 825 feet across gulch and stream
2. $99^{\circ} 9'$ 350 feet across head of gulch
3. $95^{\circ} 12'$ 600 " " " "
4. $96^{\circ} 14'$ 600 " " two gulches
5. $89^{\circ} 54'$ 650 " along head of gulch
6. $71^{\circ} 24'$ 700 " " side of Kamaileunu Ridge
7. $61^{\circ} 49'$ 850 " " " " " "
8. $69^{\circ} 39'$ 600 " " " " " "
9. $81^{\circ} 52'$ 300 " " " " " "
10. $94^{\circ} 14'$ 500 " " " " " "
11. $97^{\circ} 4'$ 300 " " " " " "
12. $106^{\circ} 47'$ 700 " " " " " "
13. $125^{\circ} 55'$ 300 " " " " " "
14. $104^{\circ} 23'$ 500 " " " " " "
15. $96^{\circ} 21'$ 100 " " " " " "
16. $72^{\circ} 55'$ 200 " " " " " "
17. $78^{\circ} 30'$ 100 " " " " " "

18. $101^{\circ} 42'$ 62 feet along side of Kamaileunu Ridge to the head of the pipe from the Kamaile pumps. Thence $128^{\circ} 50'$ 130 feet to above mentioned cross on Kamaileunu Ridge. From this cross the following Stations bear by true azimuth Paheehee mauka $301^{\circ} 31'$, Lahilahi $84^{\circ} 38'$ 5180 feet and Makaha 1st $249^{\circ} 45'$, 2207 feet; thence

8. $113^{\circ} 9'$ 408 feet down side of ridge to cross on a rock in stone wall on North edge of ditch and cane near North corner of cane. Thence

9. $256^{\circ} 26'$ 2505 feet along portion of Waianae sold by Kamehameha to Robinson and Company up side of Kamaileunu Ridge and up center

of same to a spike let into the rock at summit of ridge. From this spike the following Stations bear by true azimuth: Paheehee mauka $311^{\circ} 35'$, 10,066 feet, and Lahilahi $80^{\circ} 8'$, 7327 feet. This spike marks the Survey Station called Makaha 1st; thence

10. $224^{\circ} 50'$ 7020 feet up center of ridge along Makaha;
11. $219^{\circ} 1'$ 2949 feet up center of ridge along Makaha;
12. $209^{\circ} 36'$ 2889 feet up center of ridge along Makaha to Kawiwi peak;
13. $245^{\circ} 54' 30''$ 6380 feet up center of ridge to the West summit of Kaala; thence
14. $295^{\circ} 25'$ 6085 feet along center of ridge along Waianae-uka;
15. $347^{\circ} 10'$ 3955 feet along center of ridge along Waianae-uka; thence
16. $49^{\circ} 25'$ 6905 feet down center of ridge between Waianae Valley and Lualualei to initial point.

Area 3257 acres, more or less.

And I do hereby set apart as the Waianae Kai Forest Reserve that portion of the government land of Waianae Kai within the above described metes and bounds.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the Territory of Hawaii to be affixed.

Done at the Executive Building, in Honolulu, this 7th day of September, A. D. 1906.

G. R. CARTER,
Governor of Hawaii.

By the Governor,
A. L. C. ATKINSON,
Secretary.

BY AUTHORITY.

PROCLAMATION OF FOREST RESERVE IN THE DISTRICT OF WAIANAE, ISLAND OF OAHU.

LUALUALEI FOREST RESERVE.

UNDER and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of the Territory of Hawaii, enacted February 27, 1905, and amended by Act 65 of the Session Laws of the Legislature of 1905, enacted April 26, 1905, and of every other power me hereunto enabling, I GEORGE R. CARTER, Governor of the Territory of Hawaii, having duly given the notice and held the hearing as in said Acts provided, do hereby approve as a Forest Reserve that certain piece of government land lying on the Western slope of the Waianae Mountains, on the Island of Oahu, bounded on the West by the Lualualei Homesteads, on the North and East by the lands of Waianaekai, Waianae-uka and Honouliuli, on the South by the land of Nanakuli, in the District of Waianae, Island of Oahu, Territory of Hawaii, more particu-

larly described by and on a map made in January, 1906, by the Hawaiian Government Survey Department, which said map is now on file in the said Survey Department, marked "Registered Map No. 2165," and "Lualualei Forest Reserve, Oahu;" and a description accompanying the same, numbered C. S. F. 1659, which said description, now on file in the said Survey Department, is as follows:

Beginning at Government Survey Trig. Station "Kawaopuu," as shown on Government Survey Registered Map No. 2165, and running by true azimuths:

1. 259° 24' 4451.0 feet to + on stone and ahu;
2. 220° 50' 2260.0 feet to + on stone and ahu; near small stream;
3. 308° 52' 2283.0 feet to + on solid rock and ahu, at edge of high bluff;
4. 346° 03' 1464.0 feet to + on solid rock and ahu, on West slope of Ka Ilio;
5. 322° 26' 1730.0 feet to + on rock and ahu, to ridge overlooking Mikilua;
6. 278° 58' 654.0 feet to + on stone at base of small cliff;
7. 318° 31' 2542.0 feet to + on stone in Mikilua;
8. 327° 55' 1096.0 feet to + on stone and ahu, at base of small cliff;
9. 344° 37' 2861.0 feet to + on stone;
10. 0° 27' 1459.0 feet to + on stone and ahu;
11. 1° 46' 2004.0 feet to + on stone and ahu;
12. 7° 00' 1009.0 feet to + on stone and ahu;
13. 317° 22' 345.0 feet to + on stone at pali;
14. 35° 51' 413.0 feet along base of pali to + on rock on ridge;
15. 293° 12' 830.0 feet to + on rock, and mauka of stone wall;
16. 16° 36' 985.0 feet to + on large boulder in stone wall;
17. 334° 42' 2210.0 feet to + on stone and ahu, at edge of high bluff;
18. 32° 55' 7000.0 feet;
19. 32° 25' 3745.0 feet to + on solid rock, five feet mauka of fence;
20. 357° 57' 4214.0 feet up ridge to Heleakala Hill;
21. Thence along the watershed of the ridge, the following points being the boundary from Heleakala; Palikea; Pohakea Pass; Puu Kaua, elevation 3105 feet; Kamahoa, elevation 2720 feet; Napapa, elevation 2878 feet; Kolekole Pass; Kumakalii, elevation 2914 feet; to the initial point.

Area, 3743.0 acres.

EXCEPTING, however, and reserving therefrom the Kolekole Pass and the trail leading thereto across the Reserve, provided that the right of way for the same shall not exceed a width of twenty (20) feet on either side of the center of the trail.

And I do hereby set apart as the Lualualei Forest Reserve that portion of the government land of Lualualei within the above described metes and bounds.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the Territory of Hawaii to be affixed.

Done at the Executive Building, in Honolulu, this 30th day of November, A. D. 1906.

G. R. CARTER,
Governor of Hawaii.

By the Governor,
A. L. C. ATKINSON,
Secretary.

BY AUTHORITY.

PROCLAMATION OF FOREST RESERVE IN THE DISTRICT OF HANA, ISLAND OF MAUI.

HANA FOREST RESERVE.

UNDER and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of the Territory of Hawaii, enacted February 27, 1905, and amended by Act 65 of the Session Laws of the Legislature of 1905, enacted April 26, 1905, and of every other power me hereunto enabling, I, GEORGE R. CARTER, Governor of the Territory of Hawaii, having duly given the notice and held the hearing as in said Acts provided, do hereby approve as a Forest Reserve those certain pieces of government land lying on the Eastern slope of Mt. Haleakala, on the Island of Maui, bounded on the West and North by the Koolau District, on the East by a line following approximately the lower edge of the existing forest across the Hana District, on the South by the Kipahulu District, in the District of Hana, Island of Maui, Territory of Hawaii, more particularly described by and on maps made in March, 1906, by the Hawaiian Government Survey Department, which maps are now on file in the said Survey Department and marked "Registered Maps Nos. 1268 and 1750" and "Hana Forest Reserve, Maui;" and a description accompanying the same, numbered C. S. F. 1690, which said description, now on file in the said Survey Department, is as follows:

Beginning at Puu Hinai, a hill on the boundary of Hana and Koolau districts, and the Southeast corner of the land of Ulaino, (L. C. A. 8515B to Kanehea), and running as shown on Government Survey Registered Map No. 1750;

1. In a Southeasterly direction across the lands of Makapuu (Government), West Honomalee (fee simple), East Honomalee, Kawela, Kaeleku (all government), to a point on the shoulder of the hill called Olopawa, 1000 feet Northeast of the Government Survey Trig. Station "Olopawa";

2. Thence Southeasterly across the Government lands of Honokalani, Wakiu and Kawaipapa to a point on the pali of the Kawaipapa Gulch at the Northwest corner of Grant 3154 to Kahoomakaulii;

3. Thence along the following grants: 3154 to Kahoomakaulii, 3195

to C. Kalani et al., 883 to G. P. Judd; and L. C. A. 443 to Richardson, to the Southwest corner of L. C. A. 443 to Richardson;

4. Thence Southerly across the fee simple lands of Aleamai (L. C. A. 8660 to Kukamauna no Kaleimakalii) and Haneoo (L. C. A. 8525 B to Kauwa) to the Northwest corner of Grant 2879 to John Roe;

5. Thence across said Grant to its Southwest corner;

6. Thence across Government land of Kakio to a point on the Northern boundary of Government land of Waiohonu;

7. Thence Southwesterly across Waiohonu to a point on its South boundary, where the line makes an angle;

8. Thence across Government lands of Puuiki-Papahawahawa to a point on the Northeast boundary of Muolea (L. C. A. 8452 to Keohokalole) where said boundary turns almost due east;

9. Thence across Muolea (L. C. A. 8452 to Keohokalole) to the Northwest corner of Grant 382 to E. Whittlesey;

10. Thence along mauka boundary of Grant 382 to E. Whittlesey;

11. Thence across Government land of Wailua to Northwest corner of Grant 1155 to C. A. Bouillon;

12. Thence along mauka boundary of Grant 1165 to C. A. Bouillon to said Grant's Southwest corner;

13. Thence across Government lands of Paehala and Puaaluu to the boundary between the districts of Hana and Kipahulu;

14. Thence following up said district boundary until it intersects with the boundaries of Koolau, Hamakualoa, Wailuku, Honuaula, Kahi-kinui and Kaupo districts at the large rock on the Northeast brink of the crater of Haleakala, called Paleha;

15. Thence down Hana-Koolau boundary to initial point.

Approximate area, 14,825 acres.

And I do hereby set apart as the Hana Forest Reserve those portions of the government lands known as Puaaluu, Paehala, Wailua, Waiohonu, Kakio, Wakiu, East Honomalee, Puukai-Papahawahawa, and Hana Forest Tract (unleased part); and also any other remnants of government land not under lease, within the metes and bounds of the above described Hana Forest Reserve.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the Territory of Hawaii to be affixed.

Done at the Executive Building, in Honolulu, this 30th day of November, A. D. 1906.

G. R. CARTER,
Governor of Hawaii.

By the Governor,
A. L. C. ATKINSON,
Secretary.

BY AUTHORITY.

Notice is hereby given that CHARLES H. BAILEY, Esq., has been appointed District Fire Warden in and for that portion of the District of Kona, Island of Oahu, extending from Makapuu Point to Palolo Valley

C. S. HOLLOWAY,

Secretary and Executive Officer,
Board of Agriculture and Forestry.

November 8, 1906.

Notice is hereby given that W. F. SANBORN, Esq., has been appointed District Fire Warden in and for the District of Halelea, Kauai excepting the Wainiha Valley.

C. S. HOLLOWAY,

Secretary and Executive Officer,
Board of Agriculture and Forestry.

November 8, 1906.

Notice is hereby given that C. W. HUDSON, Esq., has been appointed District Fire Warden in and for the Wainiha Valley, District of Halelea, Island of Kauai.

C. S. HOLLOWAY,

Secretary and Executive Officer,
Board of Agriculture and Forestry.

November 8, 1906.

Notice is hereby given that JAMES MUNRO, Esq., has been appointed District Forester and District Fire Warden in and for the Island of Molokai, excepting that portion between the lands of Pukoo and Halawa, inclusive.

C. S. HOLLOWAY,

Secretary and Executive Officer,
Board of Agriculture and Forestry.

November 8, 1906.

Notice is hereby given that C. F. CONRADT, Esq., has been appointed District Forester for that portion of the east end of the Island of Oahu, extending from the lands of Pukoo and Halawa.

C. S. HOLLOWAY,

Secretary and Executive Officer,
Board of Agriculture and Forestry.

Notice is hereby given that C. F. CONRADT, Esq., has been appointed District Forester for that portion of the east end of the Island of Oahu, extending from the lands of Pukoo and Halawa.

C. S. HOLLOWAY,

Secretary and Executive Officer,
Board of Agriculture and Forestry.

CHANGE OF DISTRICT.

Notice is hereby given that F. WEBER, Esq., is now District Forester and District Fire Warden for that portion of the District of Puna, Island of Kauai, south of and including the land of Wailua, excepting the lands controlled by the Grove Farm Plantation.

C. S. HOLLOWAY,
Secretary and Executive Officer,
Board of Agriculture and Forestry.

Honolulu, Dec. 26, 1906.

Notice is hereby given that C. J. AUSTIN, Esq., has been appointed District Forester for the District of Hana, Island of Maui.

C. S. HOLLOWAY,
Secretary and Executive Officer,
Board of Agriculture and Forestry.

Honolulu, Dec. 26, 1906.

PERSONALIA.

Mr. C. J. Austin, inspector's assistant in the Division of Entomology of the Board of Agriculture and Forestry, resigned his position on November 15, 1906, to become manager of the Hawaiian American Rubber Company's plantation at Nahiku, Maui.

Mr. Austin's connection with the Territorial Bureau of Agriculture goes back a number of years. From January 1, 1901, to June 30, 1903, he held the position of gardener and was in charge of the government nursery. With the reorganization of the department by the creation of the present Board of Commissioners of Agriculture and Forestry on July 1, 1903, Mr. Austin was assigned to the Division of Entomology. As his title indicates his work since then has been primarily on the wharves, inspecting the consignments of fruits, plants and vegetables coming into the port of Honolulu.

Always an ardent believer in diversified agriculture Mr. Austin has for some time taken an active interest in rubber. He is well prepared for the work ahead of him and he goes to his new field with enthusiasm.

We have received a very interesting publication upon Sisal, and the cultivation of fibre plants generally, written by Mr. A. J. Boyd, editor of the *Queensland Agricultural Journal* Brisbane. In a communication from the author, he writes, part: "I see by the September number of the *Forester* that the export of Hawaiian Sisal has diminished to the extent of \$982. I had fully expected to hear that the export had doubled. I am planting as fast as I can get plants. My plantation is only two years old, but I can foresee a good cutting for next July. At St. Helena Plant Establishment here, they made two tons six hundredweight of fibre from less than one acre and it was sold f. o. b. here at £35 and £36.10 per ton. That beats any record I think."

The *Forester* shared Mr. Boyd's expectation of the development of Sisal exported from Hawaii. The quality of our local fibre is superb, and it would be interesting to be informed as to cause of the diminished production.

RUBBER TREES ON KAUAI.

The following details are taken from information collected by Mr. Charles S. Judd, Special Forest Agent of the Division of Agriculture and Forestry:

Koloa Grove.—Cereia trees. Three miles northeast of Koloa at the base of the ridge between Koloa and Lihue. Planted in 1895 from imported seed by Mr. Antone Cropp. The trees are set out promiscuously over five acres of ground and are intermingled with a natural forest of kukui, lauhala and ohia ai. Alligator pear, mango, orange and coffee trees are also growing among the rubber trees. Number of trees in the grove, 706. The average diameter is 6 inches; height 26 feet. Age

	years. Average dia-
	meter of trees, 104.

Board of Agriculture and Forestry.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Polioctana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the prices per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haught, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOEMER,
Superintendent of Forestry.

PUBLICATIONS FOR DISTRIBUTION. BOARD.

- Report of the Commissioner of Agriculture and Forestry for 1900; 86 pp.
Report of the Commissioner of Agriculture and Forestry for 1902; 88 pp.
* First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.
Second Report of the Board of Commissioners of Agriculture and Forestry, for the year ending December 31, 1905; 240 pp.; 8 plates; 19 text figures.
"Notice to Importers," by H. E. Cooper; 4 p.; 1903.
"Digest of the Statutes Relating to Importation, Soils, Fossils, Fruits, Vegetables, etc., into the Territory of Hawaii," General Circular No. 1; 6 pp.
"Important Notice to Ship Owners, Fruit Importers and Others, Rules and Regulations Prohibiting the Introduction of Certain Pests and Animals into the Territory of Hawaii," General Circular No. 2; 3 pp.; 1904.

DIVISION OF ENTOMOLOGY.

- "The Leaf-Hopper of the Sugar-Cane," by H. C. L. Perkins. Bulletin No. 1; 38 pp.; 1903.
* "On Some Diseases of Cane Specially Considered in Relation to the Leaf-Hopper Pest and to the Stripping of Cane," by H. C. L. Perkins. Press Bulletin No. 1; 4 pp.; 1904.
** "A Circular of Information," by Jacob Kotinsky. Circular No. 1; 8 pp.; 1905.
"The Japanese Beetle Pungus," by Jacob Kotinsky and H. M. Newell. Circular No. 2; 4 pp.; 1905.
Report of the Division of Entomology, for the year ending December 31, 1905. Reprint from Second Report of the Board; 62 pp.; 3 plates; 10 text figures.

DIVISION OF FORESTRY.

- * "Forest and Ornamental Tree Seed for Sale at Government Nursery." Press Bulletin No. 1; 3 pp.; 1905.
"Sharestone in regard to the Arbor Day Tree Planting Contest." Press Bulletin No. 2; 7 pp.; 1905.
"An Offer of Practical Assistance to Tree Planters." Circular No. 1; 6 pp.; 1905.
"Revised List of Forest and Ornamental Tree Seed for Sale at the Government Nursery." Press Bulletin No. 3; 4 pp.; 1905.
"Instructions for Propagation and Planting Forest Trees." Press Bulletin No. 4; 4 pp.; 1905.
Report of the Division of Forestry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 77 pp.; 5 plates.

DIVISION OF ANIMAL INDUSTRY.

- "Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.
"Inspection and Testing of Imported Live Stock for Glanders and Tuberculosis." Rule 2; 1 p.; 1905.
"Concerning Glandered Horse Stock in the Territory." Rule 3; 1 p.; 1905.
Report of the Division of Animal Industry, for the year ending December 31, 1905. Reprint from Second Report of the Board; 92 pp.

DIVISION OF AGRICULTURE.

- Report of the Division of Agriculture, for the year ending December 31, 1905. Reprint from Second Report of the Board; 12 pp.

* Out of Print.

Any one or all of the publications listed above (except those marked *) will be sent to residents of this Territory, free, upon application to Mailing Clerk, P. O. Box 331, Honolulu.



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YONKERS, Del., November 17.

Manager THE MUTUAL LIFE INSURANCE COMPANY OF NEW YORK.

DEAR SIR—I have received policy for \$20,000, issued to me in favor of my daughter, on the continuous installment plan.

My daughter is but eighteen years of age, and this contract guarantees to her \$1,000 at my death, and \$1,000 per annum as long as she lives, and to pay not less than twenty installments even if she should not live twenty years after my death. The reason I am so much pleased with this policy is based upon the fact that I fully realize, that no matter how much money I might leave my daughter at my death I would have no guarantee that it would last her through her entire lifetime.

The Company's liability under this form of contract might be \$50,000 or possibly \$70,000, if my daughter should live to be as old as some of my ancestors.

Yours very truly,

ISRAEL W. MARSHALL.

WRITE TO-DAY FOR RATES

The Mutual Life Insurance Company of New York

Oldest in America

Largest in the World

W. A. WANN, District Superintendent,

HONOLULU, T. H.

OFFICE 832-834 FORT STREET

the 1990s, the number of people with a diagnosis of schizophrenia has increased in the United Kingdom (Meltzer 1996). The prevalence of schizophrenia in the United Kingdom is estimated to be 1.2% (Meltzer 1996). The prevalence of schizophrenia in the United States is estimated to be 1.1% (Meltzer 1996). The prevalence of schizophrenia in the United States is estimated to be 1.1% (Meltzer 1996).

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